CRANFIELD UNIVERSITY

Mark Baker

Portfolio Performance Management in New Product Development: Examining the Influence of Feedforward Anticipatory Control on Portfolio Value and Strategic Alignment

School of Management
International Executive Doctorate

DBA
Academic Year: 2009 - 2013

Supervisor: Mike Bourne

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ABSTRACT

The organization I work in has 13 subsidiary businesses operating in the branded footwear and apparel industry. The industry currently faces significant macroeconomic and industry challenges. One of our biggest challenges is how to avoid excessive and wasteful new product development whilst still building an attractive range of products for the customer. So the focus of my research is on the management control and governance of the New Product Development (NPD) process to solve a pressing business problem.

However, there is a gap in the literature. Many authors have claimed that our knowledge of the governance of NPD processes is incomplete and there is a dearth of actual studies in this area. My literature review looked at management control and in particular at the enduring problem of the need to generate control without stifling creativity. The literature led me to focus on the use of feedforward controls to influence NPD management teams to improve portfolio value and strategic alignment whilst simultaneously encouraging NPD experimentation. During this research I developed the concept of Feedforward Anticipatory Control (FAC), which encompasses the combination of feedforward control and double-loop learning. From this start my research question became “How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?”

From theory and my initial case study research I developed, tested and refined a tool for ascertaining the level of FAC sophistication in use by NPD teams in their development process. The tool was then used in action research interventions to help the teams develop their sophistication in the use of FAC. The tool was found to be useable, useful and have value. The action research case studies were embedded in a case study protocol to ensure the rigour of my research. This involved developing a framework to investigate the consequences of my interventions, in terms of both hard performance metrics and softer team perceptions.

The contribution is in the use of management controls in NPD. The findings show that different levels of FAC sophistication can be applied in NPD and that the use of higher levels of FAC influences NPD teams to improve portfolio value and strategic alignment.

The contribution to practice is an intervention “toolkit” that can influence NPD teams to develop higher levels of FAC sophistication and generate improvements in NPD portfolio performance.

Keywords: Feedforward control, new product development, portfolio management, performance management

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LIST OF ABBREVIATIONS / TERMS

Brand	The unit of analysis in P2, a separate, self-contained business unit
CAD	A computer-aided design drawing of the product
FAC	Feedforward anticipatory control
KPIs	Key performance indicators
LOC	Simons' levers of control framework
MACS	Management and accounting control systems
MCS	Management control systems
MCDM	Multi criteria decision making
MO	Market orientation
MOQ	Minimum order quantity, as set by a third party vendor
NPD	New product development
PDMA	Product Development and Management Association
PIC	Product innovation charter
PMS	Performance measurement system
Product Category	Categories of products can be constructed around different labels. For example, gender (mens, womens, childrens), or type of product (footwear, apparel, equipment), or segmentation e.g. football, running, lifestyle; basic, core, premium; boots, shoes, sandals.
R&D	Research and development
R&NPD	Research and new product development
RO	Resource orientation
SBU	Strategic Business Unit
SCO	A style colour option. This is a style defined by design colours e.g. a style in three colourways; black, blue and green. This is one style with three SCOs.

SKU	Some brands interchange the word SCO with SKU. The correct definition is a stock-keeping unit. This is a SCO defined by the product sizing e.g. small, medium, large, extra-large.
SMU	A “special make-up” is a SCO that has a change made to the standard specification and is sold exclusively to a single customer
SPM	Strategic performance measures
SR	Systematic Literature Review
Style	A style is a product defined by its shape, construction, materials and types of branding application
Unit / Kit	The sole unit of the shoe, the base of the shoe, which may require capital investment for manufacture.

LINKING DOCUMENT

1 INTRODUCTION

This introduction discusses the business problem driving my overall research study, the research question that I develop from a review of the literature and an explanation of the concepts that are core to the overall study. The three projects, as part of the DBA, are discussed and the findings and contribution of this work are presented. The final part of the introduction describes how I have structured the rest of the Linking Document.

Firstly I discuss the business problem driving the overall study.

1.1 The Business Problem

I work in the global branded footwear and apparel industry. The industry is worth an estimated $300 billion annually and faces growing macroeconomic and industry-specific challenges. The key macroeconomic challenges are labour and material cost inflation from the predominantly Asian manufacturing base, a reduction in Asian manufacturing capacity as capital and labour move into different industries, and a lack of growth combined with retail price deflation in Western economies. Industry-specific challenges are the dynamic, volatile and unpredictable nature of demand, short product lifecycles, high levels of product variety combined with frequent product range changes, and complex, extended global supply chains requiring quick responsiveness to fashion trends.

Against this complex backdrop, a significant and growing challenge for the industry is the increasing cost of excessive and underperforming product development. This is product development that does not enhance performance and hence is superfluous rather than functional (Bisbe and Otley 2004). This can happen when excessive new product development dilutes overall profit margins, design and development costs exceed the product margin, or large numbers of low-volume products significantly damage relationships with vendors (Baker and Bourne, 2014).

My organization has a portfolio of 13 subsidiary brands operating in the branded footwear and apparel industry. Within these brands the product design, physical realisation of the product idea, manufacture and sale into the market is managed by cross-functional new product development (NPD) teams. It is in this activity, called

“product range building”, where NPD management teams build the composition and size of the range and where products developed and sold can enhance or dilute performance. This is a key activity for business performance and the creation of value. Therefore my initial business problem was “How can we better performance manage the product range build activity?”.

When looking at the product range build activity in more detail I realise that the performance outcome is dependent on the crucial activity of selecting the products that are to be developed in the range. The selection of products is determined by the application of management controls during the NPD process. When undertaking a systematic literature review of the use of these management controls in NPD I develop a research question: “How does the use of feedforward anticipatory control (FAC) influence NPD management teams to improve portfolio value and strategic alignment”?”.

This research problem contains three core concepts; Feedforward Control, NPD Portfolio Value and Strategic Alignment. In the next sub-section I explain these concepts.

1.2 Concepts

In this section I will now explain each of these three concepts in turn, starting with feedforward control.

1.2.1 FEEDFORWARD CONTROL

Feedforward control is defined as an ‘anticipatory control in which preventative action is taken before the difference between planned and actual performance occurs’ (Ishikawa and Smith, 1972, 166) and involves ‘future directed controls’ (Koontz and Bradspies, 1972). Feedforward control is an approach to address the time delay problems of feedback, where performance is fed back later, after occurrence of the event, causing persistence of deviation from plan. Notable characteristics of feedforward control are the timing of when the control is applied, before the deviation from plan occurs, and its association with planning.

1.2.2 NPD PORTFOLIO VALUE

My second concept is NPD portfolio value. In the branded footwear and apparel industry NPD is characterised by a stage and stage-gate process (Cooper, 1990).

Typical stages are; seasonal strategy planning, concept development, product specification development, physical sample development, final portfolio review and launch to the market. The process is managed by a cross-functional NPD team, typically consisting of the roles of; Category Manager, Product or Design Manager, Product Developer, Supply Chain Manager and Business Analyst. The NPD team manages the composition and size of the NPD product portfolio. A brand can have a number of these NPD teams, operating as separate self-contained units, managing NPD portfolios.

Product selections made by the NPD team will affect whether the NPD portfolio will or will not create value. NPD portfolio value is the realised profit when the product portfolio is launched and sold into the market. I measure this realised profit from the revenue the portfolio generates when sold in the market after deducting the product costs in making the sale.

Portfolio value is a key NPD outcome. In managing the NPD portfolio the team can identify value contribution, select profit maximising products, reduce wasteful developments and evaluate trade-offs among products in the portfolio.

1.2.3 STRATEGIC ALIGNMENT

My third concept is strategic alignment. Along with NPD portfolio value, strategic alignment is also a key NPD outcome. NPD product selection is the result of cross-functional input and involvement. NPD team cross-functional input is significantly related to NPD performance (Davila, 2000). Product selection and portfolio management should be consistent with the organization's objectives, with the need to achieve integration and co-ordination across the involved functions. Strategic alignment is the direction and co-ordination of 'decisions and behaviours in line with overall corporate objectives' (Frow et al., 2005), where the NPD portfolio and allocation of resources 'mirrors the strategic priorities of the business' (Cooper et al., 2002). I assess strategic alignment by observing the consultation, collaboration, integrated problem-solving, cross-functional planning and goal congruence in the NPD team.

Having outlined the three key concepts I use in my thesis, in the next section I discuss the key elements of my DBA study.

1.3 The Study

There are three projects that make up this DBA study. I start with a systematic literature review and follow this by two empirical studies in my business. In this sub-section I will present the three projects of the DBA, in turn.

1.3.1 SYSTEMATIC LITERATURE REVIEW

My systematic literature review (Project 1) captures how management controls enable and constrain NPD. 78 papers are selected for critical review. The papers study both theoretical and empirical research of the use of management controls in NPD. From the findings I develop the research question “How does the use of feedforward anticipatory control influence NPD management teams to improve portfolio value and strategic alignment”?”. In the literature review I also find guidance on how to conduct empirical studies of management controls in NPD. I am able to use this guidance for the two empirical studies in my research.

To provide answers to the research question requires a study where I can measure how NPD teams use feedforward control and also where I can relate this change to measures of the NPD portfolio performance achieved by the team. This requires the development of a framework to measure the use of feedforward control by NPD teams and a performance framework to measure NPD portfolio performance. I develop these frameworks in my second project, which is described next.

1.3.2 FIRST EMPIRICAL STUDY – CASE STUDY

I develop the two measurement frameworks in the first empirical project, using the literature and empirical findings from my case study research (Project 2).

The first framework I develop is the FAC Framework which captures data on the use of feedforward control by the NPD team. Initially I develop the framework using deduction and logic. I refine and complete the framework using empirical induction.

The second framework is a Portfolio Performance Framework that captures data on NPD portfolio value and data on strategic alignment. I develop this framework using empirical induction, where I observe and interview NPD teams.

From these initial case studies I observe that NPD teams that apply higher levels of feedforward control sophistication generate higher portfolio values and greater strategic

alignment. This observation led me to develop two propositions to guide my final empirical study. The propositions I develop are:

1) *A change to higher levels of FAC sophistication influences NPD management teams to improve portfolio value.*
2) *A change to higher levels of FAC sophistication influences NPD management teams to improve strategic alignment.*

To test these propositions requires study of NPD management teams, changing their use of feedforward control and capturing the portfolio value and strategic alignment outcomes. I study this change in the NPD teams' use of feedforward control through longitudinal action research.

1.3.3 FINAL EMPIRICAL STUDY – LONGITUDINAL ACTION RESEARCH

In the final phase of my research (Project 3) I test the propositions using a longitudinal action research study that intervenes in six cases that are separate self-contained NPD teams.

The intervention changes the use of feedforward control applied by the NPD teams. Multiple methodological lenses are used to capture data on changes in portfolio performance and value, and in strategic alignment. I observe how the NPD teams change their product selection controls over time, post-intervention. I also test the FAC Framework for feasibility, usability and utility (Platts, 1993) to assess its practical utility in the performance management of NPD portfolios.

1.4 Findings and Contribution

This introductory sub-section notes the findings and contribution from my study. There is a contribution to theoretical knowledge, an empirical contribution and a contribution to knowledge of practice.

Firstly I note the findings and contribution to theoretical knowledge.

1.4.1 FINDINGS AND CONTRIBUTION TO THEORETICAL KNOWLEDGE

From the literature and empirical study I develop the FAC Framework. From the resulting framework I find that different levels of feedforward control sophistication can be applied in NPD portfolio performance management. This finding is claimed as a contribution to theoretical knowledge.

In my first empirical study I observe that NPD teams that apply higher levels of feedforward control sophistication generate higher portfolio values and greater strategic alignment. I make this observation when I compare the portfolio performance of one particular case “Sport-Two” that is operating at a much higher level of feedforward control sophistication compared to the other cases studied. This finding is an influential prompt to my selection of longitudinal action research for the final empirical study.

1.4.2 FINDINGS AND EMPIRICAL CONTRIBUTION

In my final empirical study, using longitudinal action research, I investigate the outcomes on portfolio value and strategic alignment of increasing FAC sophistication. The intervention I use changes the level of FAC sophistication applied by the NPD team in managing the NPD portfolio. I find that if a NPD team increases the applied level of FAC sophistication in NPD portfolio product selection the observed outcomes are higher portfolio values and greater strategic alignment. In addition to the NPD teams where I intervened, I maintained a control group of three NPD teams where I did not intervene. In the NPD teams where there is no change in the applied level of FAC sophistication there is not the same apparent increase in portfolio value and no indication of improvement in strategic alignment.

In my final empirical study I am not satisfied to just capture the portfolio value and strategic alignment outcomes from the change in FAC sophistication. To increase the validity of my research I identify the mechanisms of the changes in controls adopted by the NPD teams over time, when moving to higher levels of FAC sophistication. These mechanisms are generative mechanisms, producible and reproducible across the studied intervention cases.

From all this work I believe that when NPD teams increase the level of applied FAC sophistication there is a tendency to generate higher portfolio values and greater strategic alignment. This finding is claimed as an empirical contribution. The generative mechanisms I identify explain why the tendency exists.

1.4.3 CONTRIBUTION TO KNOWLEDGE OF PRACTICE

The intervention approach in the action research study involves the sequential presentation of graphical charts. The FAC Framework and the Portfolio Performance Framework are two graphical charts presented in the intervention. The NPD Teams find

that these frameworks are able to be used, are useable and have utility (Platts, 1993) in the performance management of NPD portfolios. The intervention motivates the NPD teams to achieve higher levels of FAC sophistication applied in the NPD process and this influences the NPD teams to improve portfolio value and strategic alignment. The graphics represent a practical “toolkit” for intervention with other NPD teams to improve portfolio value and strategic alignment.

The intervention approach therefore represents a contribution to knowledge of practice.

1.5 Structure of the Rest of the Linking Document

The rest of the Linking Document is structured in five sections.

Firstly I discuss the theoretical positioning of the work which is in the management control systems theory sub-field of the performance management of NPD portfolios. Next I summarise the research process and methods, including a discussion on ontology. The next section discusses the findings and contributions, including the contribution to theoretical knowledge, the empirical contribution and the contribution to knowledge of practice. This is followed by a section on the managerial implications. Finally I discuss the limitations of the study and areas for further research.

First I discuss the theoretical positioning.

2 THEORETICAL POSITIONING

I now discuss the theoretical positioning of my research.

This research study is in the field of management control systems theory, in the sub-field of NPD portfolio performance management. Management control theory sits within the “grand theory” of systems and control theory (Weiner, 1950; Von Bertalanffy, 1950).

Systems thinking can be used to understand the interaction of inputs and the environment and recognises the use of controls in the system (Von Bertalanffy, 1950). In an organizational context managers use controls to monitor and evaluate performance and to minimise differences between planned and actual performance (Bart, 1993; Koontz and Bradspies, 1972; Ishikawa and Smith, 1972). Senior managers use management controls to overcome inertia, communicate strategic agendas, set targets, ensure management attention on strategic initiatives and focus learning on strategic uncertainties (Simons, 1994, 1995).

To improve performance, management use controls for constantly evaluating goals and activities (Burton et al., 1988), for strategic renewal (Simons, 1994), for obtaining information needed to reduce uncertainty (Nixon, 1998) and to control the strategy process (Marginson, 2002; Miller and Friesen, 1982). Management controls are used to identify the value contribution (Jørgensen and Messner, 2009), select profit maximising initiatives (Bisbe and Otley, 2004; Simons, 1994) and evaluate trade-offs among projects (Bisbe and Malagueno, 2009; Miller and Friesen, 1982).

Feedforward control, a management control application, has a specific role in minimising the difference between planned and actual performance and to improve performance of strategy and project selection. The control anticipates the need for preventative action that is taken before the difference between planned and actual performance occurs (Ishikawa and Smith, 1972). A notable feature of feedforward control is the timing of the control function and its association with planning. The control is an anticipatory control (Ishikawa and Smith, 1972) that involves future directed controls (Koontz and Bradspies, 1972), focusing on strategic uncertainties (Bisbe and Malagueno, 2009) and can be used in product or project selection assessment (Jørgensen and Messner, 2009). Therefore the use of feedforward control can help improve performance. My systematic literature review identifies the crucial role of FAC in managing the performance of NPD. FAC is defined by the combination of feedforward control and double-loop learning (Baker and Bourne, 2014; Argyris, 1976, 1977). I describe this in more detail in the systematic literature review (Project 1), in section 4.2 and specifically in section 4.2.3.

Management control system design and use is positively related to NPD performance (Davila, 2000). However, there is a concern that excessive management control, or management control that is too formal or rigid can constrain or stifle new product development (Radosevich, 1977; Cowen and Middaugh, 1988; Davila, 2000; Frow et al., 2005; Morris et al., 2006). On the other hand, management controls can curb profligacy and reduce excessive and wasteful new product development (Miller and Friesen, 1982; Simons, 1994; Langfield-Smith, 1997; Bisbe and Otley, 2004). Therefore, to improve performance, management controls simultaneously needs to curb wasteful product development but not stifle it. Management controls should reduce risk, assist with strategy and goal alignment, decrease uncertainty and at the same time encourage risk tolerance and NPD experimentation (Peters and Waterman, 1982;

Simons, 1994, 1995; Davila, 2000; Bisbe and Otley, 2004; Morris et al., 2006; Richtnér and Åhlström, 2010). If FAC has a valuable role in influencing NPD management teams it will curb excessive and wasteful product development but not stifle it, assist in achieving strategic alignment, and improve performance, measured by the value delivered from the product portfolio.

The importance of feedforward control in NPD has been recognized (Koontz and Bradspies, 1972) and FAC is discussed in my systematic literature review as having a crucial mediating role at the point of product selection. Therefore I was surprised in the systematic literature review not to find any theoretical or empirical study that explains how this control influences NPD management teams, to reduce wasteful product development, encourage experimentation and assist with strategy alignment. The use of feedforward control in NPD has been noted but even now it is not understood how this control influences NPD management teams to improve performance (Jørgensen and Messner, 2009; Bisbe and Malagueno, 2009).

This gap in understanding helped me identify the research question: “How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?” Answers to this question can provide contribution to management controls knowledge in NPD portfolio performance management and also contribution to practice, in the management of product range building.

I have looked at FAC in three different ways. Firstly with a systematic literature review in Project 1 to understand what we know, secondly with an empirical study in Project 2 that develops a FAC Framework and finally Project 3 is an action research study that tests the FAC Framework with NPD management teams.

In the next section I discuss the research process and methods used to find answers to the research question.

3 RESEARCH PROCESS AND METHODS

This section summarises the research process and methods used in each stage of the research study; the scoping study and the three projects. The key findings from each project are summarised.

My philosophical perspective and its implications are considered and the selection of methods is justified. The approach to ensuring quality of the methods is also discussed.

Firstly I consider ontology.

3.1 Philosophical Perspective - Ontology

In making decisions about the selected research methods and the methodological approaches used in this social sciences enquiry I have to consider ontology. I have to assess the ways that I can gain the knowledge to answer the research question and take account of epistemology. I have to consider my view of reality, what can be known and how to present this knowledge reliably.

I think of myself as a “critical realist” (Bhaskar, R., 2011; Miles and Huberman, 1994). The term critical realism came about from the merging of the terms “transcendental realism” and “critical naturalism” (Bhaskar, R., 1998), which considers that the purpose of social scientific research is to improve our interpretations of reality and to search for generative mechanisms (producible or reproducible mechanisms) and structures. A key ontological assumption is that events can occur independently of how social actors experience them (Blaikie, 2007). There are “empirical” domains where events can be observed, the “actual” domain which may or not be observed and the “real” domain which contains the mechanisms or structures that produce the events.

This leads to a distinction of “transitive” objects, the theories, concepts and models and the “intransitive” objects, the ‘real entities’ and how the relations of these entities make up the social world (Blaikie, 2007). This means that I think ‘social phenomena exist not only in the mind but also in the objective world’ (Miles and Huberman, 1994) and that fairly steady ‘lawful’ relationships can be found in this social domain. Most of the constructs that ‘underlie individual and social life’ are not visible to humans, in a physical sense, but that does not make them invalid (Miles and Huberman, 1994).

A key feature of this philosophical perspective is that causal explanations are sought and multiple event evidence needs to be captured that presents examples of that explanation. The philosophy also considers that predictive certainty is not possible and that the most that can be expressed from a series of observed events are the ‘tendencies caused by the underlying generative mechanisms’ (Partington, 2000, 2002). A tendency denotes ‘characteristic ways of acting or effects of mechanisms which may or may not be actualised’ (Bhaskar, 1998).

Therefore my methodological selection looks to observe phenomena in a social setting, capturing what is seen in the objective world, and also to understand participants' views, perspectives and understanding of the phenomena, to capture how the event "exists" in their minds and to search for generative mechanisms. Therefore my methodological orientation is towards qualitative empirical study using both observation and interview methods.

Next I present the overarching framework for this study, the "Engaged Scholarship" model (Van de Ven, 2007) shown in Figure 1. It is helpful to understand this overarching framework and the importance the approach places on a research design that aims to solve a real business problem. This framework is aligned to my ontology and the methodological orientation I have described.

3.2 Overarching Research Framework

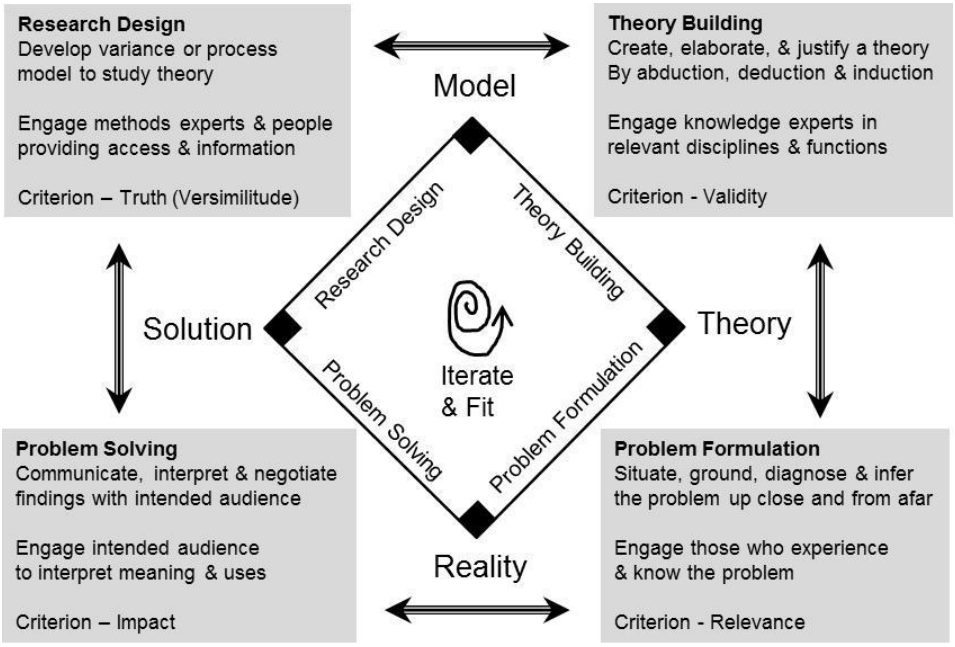
Four activities are involved in an engaged scholarship research project (Van de Ven, 2007 p29):

1) Problem formulation – a real world grounding of the research problem and question
2) Theory building – developing a conceptual model or framework that addresses the problem, for that particular context
3) Research design and conduct – empirical study using the model or framework, that addresses the research question
4) Problem solving – apply the findings to solve the research question 'about the problem existing in reality'.

The approach taken for this overall study, following the model, first identifies a business problem situated in reality, the problem of how to better performance manage the product range build activity. The next step, elaborating theory to create a framework, is firstly carried out with a systematic review of the literature, on management control systems and NPD, and then combined with the results of the first empirical study, in Project 2. Next, the framework is tested in Project 3, using an interventionist action research methodology, and an assessment is made of whether the problem has been solved.

My research study has completed each of all four activities in the cycle of the engaged scholarship model, including that of “problem solving”, where application of the findings has helped find a solution to the real business problem.

Figure 1 Model of Engaged Scholarship (Van de Ven, 2007)



The scoping study is briefly discussed next.

3.3 Scoping Study

In the DBA the purpose of the scoping study, in the early part of the overall course, is to ensure that an appropriate research issue has been identified and that the evolved literature review questions for Project 1 are also appropriate. Therefore this section captures how, having established the business problem, the literature review questions were determined.

The scoping study identified the business problem; “How can we better performance manage the product range build activity in the branded footwear and apparel industry?”. The systematic literature review questions were developed, in the scoping study, by focusing on the key management controls being used in the stage-gate review meetings. In terms of the range build activity, the key control is a mechanism that mediates between information gathered and reviewed and the go / “kill” / hold / recycle product decision (Cooper, 1990), that moves the product into the next stage of the process, in respect of each product in the portfolio. The two key controls identified in the

scoping study, that form this mediating control mechanism, are “boundary controls” and “forecasting value outcomes”.

Boundary controls are simple limits, levels or hurdles, which may or may not be pre-determined by management, using measures. For example, “the product gross margin has to be greater than 40%”. The regular or continual use of evaluation and judgement that forecasts a future value outcome is the second control, for example, “this product will create more cash profit than the other products”. Therefore the review questions for the systematic literature review (Project 1) were;

1) How do the following controls enable and constrain NPD:
   - Boundary controls
   - Forecasting value outcomes?
2) How do they work in combination to enable and constrain NPD?

The justification for using systematic literature review and the P1 process is discussed in the next sub-section.

3.4 Systematic Literature Review - Project 1

The justification for using a systematic literature review in Project 1 is discussed and the process applied and the key findings are presented. First, the selection of the method is discussed.

3.4.1 WHY A SYSTEMATIC LITERATURE REVIEW

The literature review is a significant component of any academic research project.

Attainment of transparency in approach of search, analysis and synthesis, that is replicable, rigorous and scientific can be achieved by systematic literature review (Tranfield et al., 2003; Denyer and Tranfield, 2009). Systematic literature review is also an approach that seeks to minimise researcher bias.

It is important to my study that the research methodology is both rigorous in the search, review, data extraction and synthesis of available evidence and also succeeds in providing relevance to the practitioner community. Therefore to comprehensively gather, analyse and synthesize extant literature, in the fields of management control systems and NPD, systematic literature review was used for the literature review.

3.4.2 PROCESS AND KEY FINDINGS

In the systematic literature review I select 78 papers for study. The process involves full paper critical reviews, where a critical analysis of each text is undertaken using a developed extraction data guide (Wallace and Wray, 2006). Common themes and factors are grouped together, following an axial coding approach (Strauss and Corbin, 2008) and coded by paper, using this “extraction” data. 19 codes are identified and a coding saturation by paper is presented in the results.

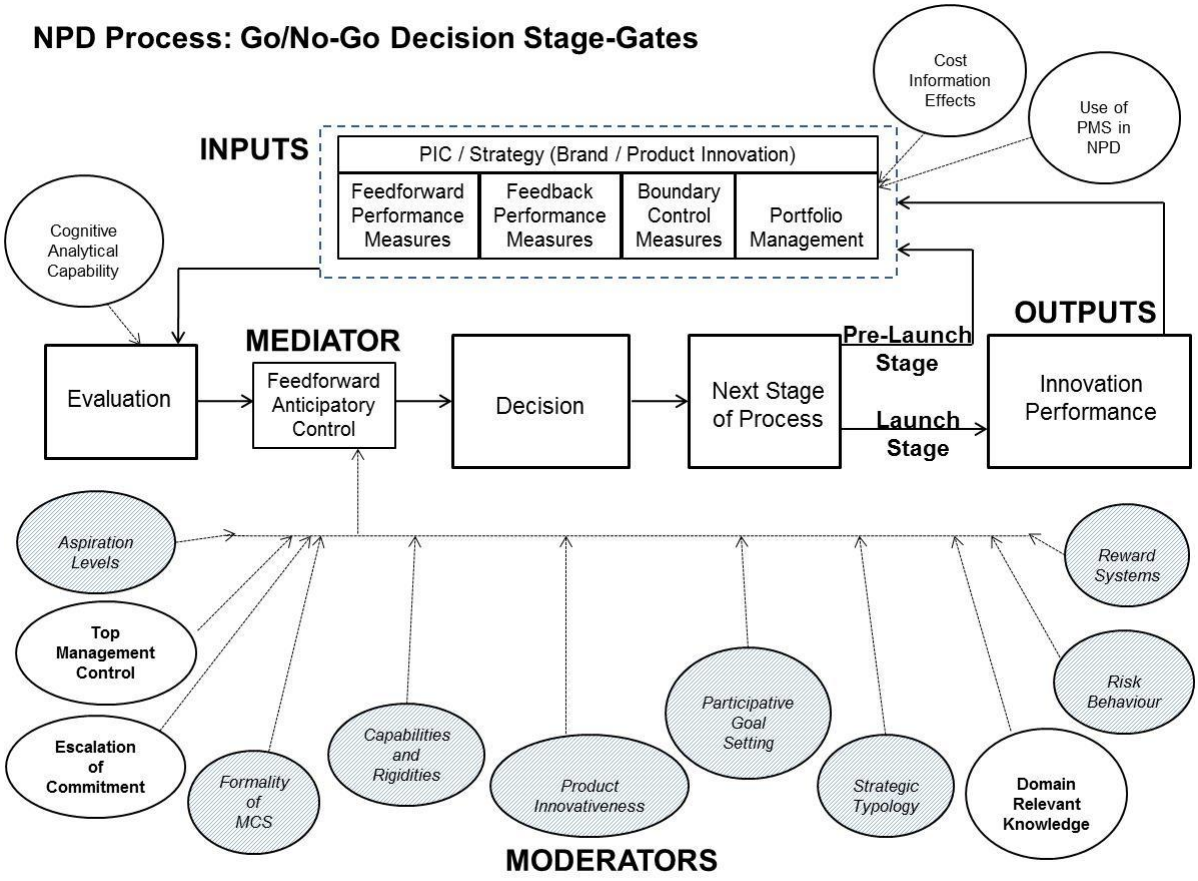
The next step in Project 1 summarises the empirical studies of the use of management controls in NPD, along with feedforward findings and extraction data. An early conclusion from the review is that “forecasting value outcomes”, a keyword and search string used in the review, is another conceptualization of “feedforward control”. The extraction data from each of these papers contains the particular studies research question, theoretical base, methodology, context and key claims and are presented in the results. 28 of these papers are empirical studies and are discussed in the results.

Having established the coding saturation by paper it is a relatively simpler activity to capture the categorizations, for the findings, by coding, in a rigorous manner. A synthesis of the findings is presented in the results with a graphical model (Figure 2) which is a useful way of describing emergent explanations of phenomena (Whetten, 2002).

I develop the concept of “feedforward anticipatory control” from the literature review findings. The review finds that the control has been operationalized or identified theoretically as anticipatory control, strategic value planning, scenario planning, forecasting, management controls and goal setting, evaluation and screening criteria and feedforward controls and metrics (P1: Table 2). The concept is developed by combining these anticipatory and planning controls with double-loop learning (Baker and Bourne, 2014; Argyris, 1976, 1977), where management assess the validity of the targets and whether the forecast outcomes meet targets. Double-loop learning is a feedforward loop with target validation (Argyris, 1976, 1977).

A number of findings are noted in literature review. First, that there is a notable scarcity of research in the use of management controls in NPD (Davila, 2000; Bonner et al. 2002; Saunders et al., 2005; Kester et al., 2011). Next, that FAC has a significant and vital role in the management of stage-gate NPD. The control can help manage uncertainty in NPD, balance creativity and control, apply feedforward screening criteria and metrics, involve anticipatory scenario planning and constrain excessive and wasteful product development.

Figure 2 Graphical Synthesis of Systematic Literature Review Results (Project 1)



The shaded moderators (Figure 2) are those controlled for in the empirical research design.

The findings also show that the NPD literature notes a concern with too many low value under-performing products in NPD portfolios and the need for effective go/no-go gates (Cooper and Edgett, 2003). Leading NPD firms are noted for having integrated portfolio

management in the NPD process, creating a set of strategically aligned, 'balanced' and appropriate number of new product projects (Cooper et al., 2000, 2002). Evaluating, ranking and prioritizing new product developments is important to improving portfolio value (Cooper and Edgett, 2003). The management control literature notes that effective product selection in portfolio management, evaluating trade-offs between competing requirements, achieves portfolio value and strategic alignment (Bisbe and Malagueno, 2009; Miller and Friesen, 1982; Akroyd and Maguire, 2011).

In summary, these systematic literature review findings are:

- A scarcity of research in the use of management controls in NPD
- FAC has a significant role in enabling control without stifling creativity
- Concerns of too many under-performing products in NPD portfolios
- The importance of composition, size and strategic alignment in NPD portfolio performance
- The importance of effective evaluation criteria to improve NPD portfolio values
- The key goals of NPD portfolio management are portfolio value and strategic alignment.

In a systematic review of the literature I did not find any theoretical or empirical studies of the use of feedforward controls in NPD. Another finding of the literature review is the positioning of FAC, in a mediating role, in the stage-gate process, between evaluation and decision (Figure 2). The review also identifies guidance for management control studies in NPD that they should be longitudinal, qualitative, focus on the stage-gates, capture performance outcomes and have data triangulation.

My systematic literature review helps determine the research question to be addressed in the empirical studies; "How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?"

To provide answers to the research question requires a study that changes FAC and captures changes in performance. Therefore, the first empirical study, Project 2, uses applied empirical research to establish frameworks for measuring changes in FAC and changes in performance for the planned interventionist empirical study (Project 3).

3.5 First Empirical Study – Project 2

First, the Project 2 methodological selection is discussed, based on guidance from the systematic literature review. Next the research process is described and the key finding of the FAC Framework showing different levels of FAC sophistication that can be applied by NPD management teams in the NPD process. The propositions, developed in the first empirical project, for testing in the action research study, are also noted.

First the methodological selection is discussed.

3.5.1 METHODOLOGICAL SELECTION

For studies of management controls in NPD, I found in the literature review scholarly concerns around distortions caused by retrospective capture of data and information (Danneels and Kleinschmidt, 2001; Chiesa et al. and Noci, 2009; Richtnér and Åhlström, 2010), informant post hoc rationalization (Bonner et al., 2002; Saunders et al., 2005) and the difficulties and challenges to ascertain management controls impact when the actual market performance of the product is not understood or captured (Saunders et al., 2005; Chiesa et al. and Noci, 2009).

Extant literature suggests that these challenges can be overcome by using a longitudinal methodology that follows the product cycle through the NPD process and captures the product market outcome. Other guidance from the literature emphasises qualitative study to understand the dynamics and interplay between management controls and product development, observing the links between constructs rather than the constructs themselves and multiple informants to enable data triangulation. The systematic review results also identifies that such research should concentrate on the stage-gates with subsequent follow-up interviews.

This guidance from the literature is also aligned to my preferred methodological selection, as discussed earlier. In summary, the systematic review guides empirical research methodology for management control studies in stage-gate NPD: longitudinal study that follows the NPD process (Danneels and Kleinschmidt, 2001; Schmidt and Calantone, 2002; Bonner et al., 2002; Saunders et al., 2005; Revellino and Mouritsen, 2009; Richtnér and Åhlström, 2010); qualitative study (Marginson, 2002; Christiansen and Varnes, 2008; Chiesa et al. and Noci, 2009); observing the stage-gate meetings, with follow-up interviews (Schmidt and Calantone, 2002; Saunders et al., 2005; Christiansen and Varnes, 2008; Richtnér and Åhlström, 2010); capturing product performance outcomes (Saunders et al., 2005; Chiesa et al. and Noci, 2009; Richtnér

and Åhlström, 2010); observing the links between constructs (Revellino and Mouritsen, 2009); and data triangulation (Davila, 2000; Bonner et al., 2002; Revellino and Mouritsen, 2009).

This literature guidance is taken into account when selecting the research methods for the empirical projects in my DBA.

3.5.2 PROCESS AND KEY FINDINGS

Using the guidance from the literature for empirical study of management controls in NPD, my first empirical study used stage-gate review meeting observation, semi-structured interviews, focus groups and documentation. The DBA timeline and NPD "clock speed", the unit of analysis and the triangulation requirements all needed careful consideration in the methodology.

The DBA timeline had to be considered when determining the research environment and context that will enable study of stage-gate NPD processes and outcomes. An industry with a relatively fast NPD cycle time is required. The branded footwear and apparel industry is an ideal industry to apply the methodology given the relatively fast "clock speed". The NPD stage-gate process cycle time, from the new product "concept stage" to the "launch to market stage", is typically between 26 to 52 weeks. Therefore selecting a unit of analysis in this industry was likely to achieve the design and methodological requirements.

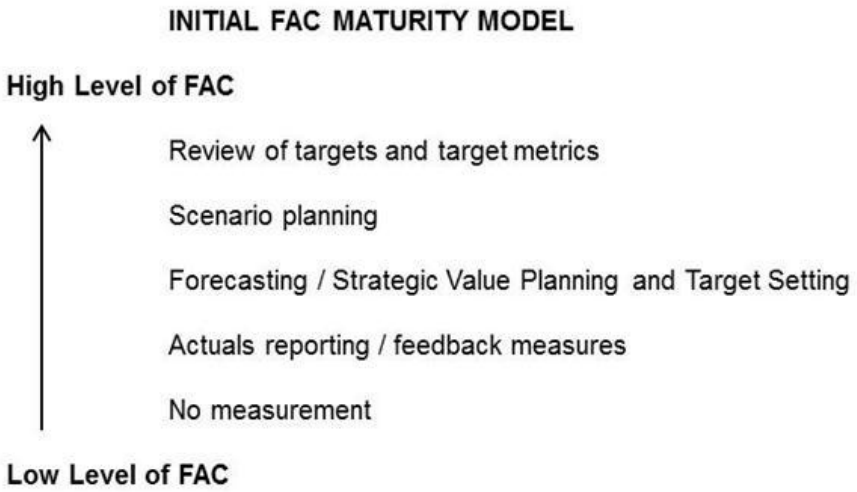
My organization has a number of brands that operate as separate subsidiaries, as self-contained business units. Eight of these brands were selected for study in Project 2, as multiple units of analysis in a single organization (Yin, 2009; Bourne et al., 2005). This research design has significant benefits, in that many of the systematic literature review identified FAC moderators can be controlled for in the design. These eight brands have aggregate sales of $1.2bn and employ a total of 715 people.

Two frameworks are developed in Project 2. The first is the FAC Framework that can assess FAC sophistication levels, before and after intervention. The second framework is a Portfolio Performance Framework that can be used to measure changes in NPD portfolio performance.

I develop the FAC Framework in two stages. The first stage involves the output of the systematic literature review and uses the operationalized descriptions of FAC (P1:

Table 2). Using logic, an initial deductively developed framework is constructed. The second stage, using empirical induction, refines the initial framework to develop the final FAC Framework (Figure 3).

Figure 3 Comparison of the Initial Deductively Developed FAC Framework and the Final Inductively Refined FAC Framework



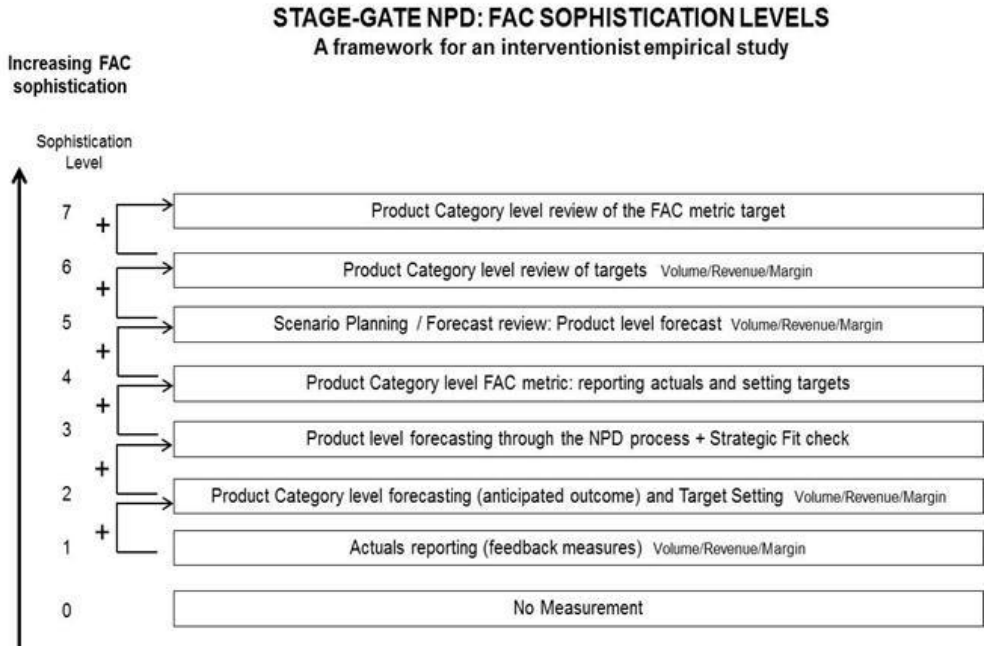
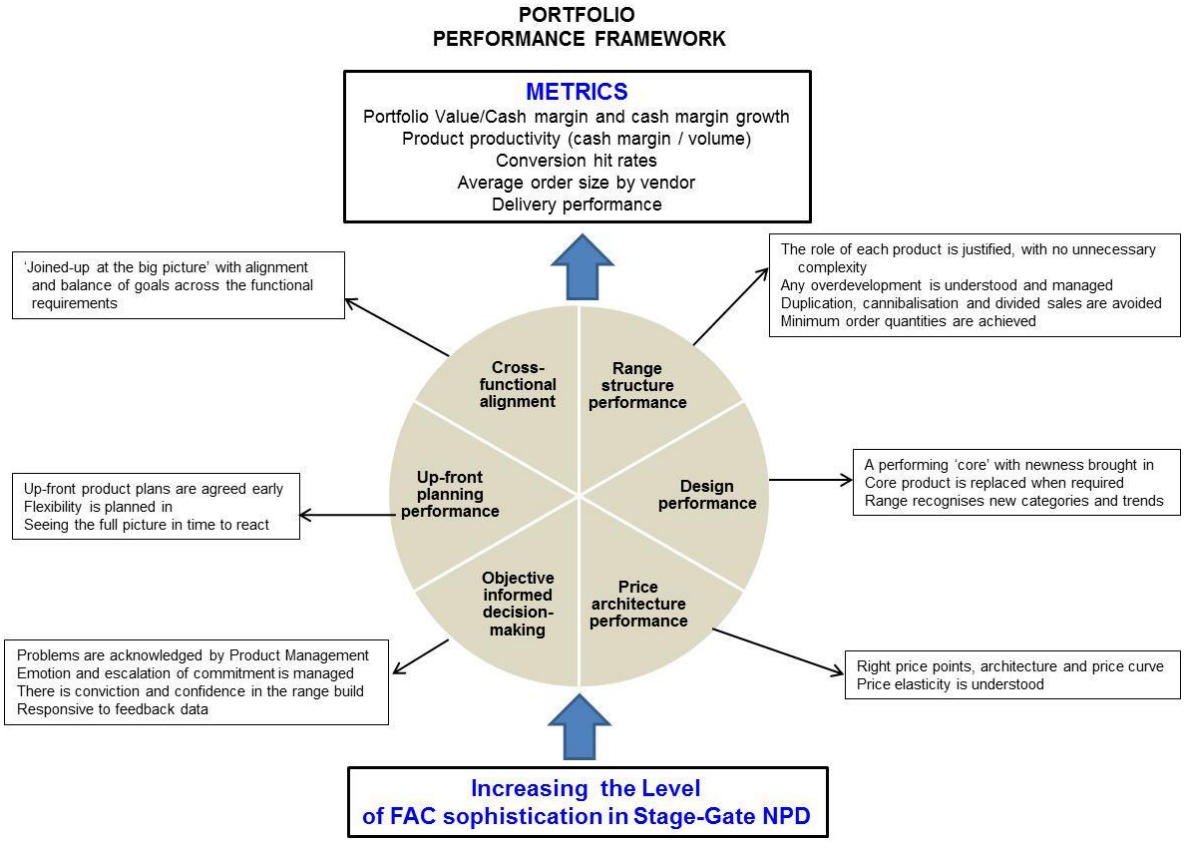


Figure 3 compares the initial deductively developed framework with the final FAC Framework developed from empirically derived inductive refinement.

The second framework, the Portfolio Performance framework is developed by empirical induction (P2: Figure 31).

P2: Figure 31 Portfolio Performance Framework



Study findings or conclusions are 'likely to be more convincing and accurate' and allow 'convergence of evidence' if they are based on triangulation using several different sources of data and information (Yin, 2009 pp114-116). Project 2 has used four main sources of information and data collection, with multiple participants and informants; observing stage-gate NPD review meetings, semi-structured interviews, focus groups and product range planning reports and documents. This approach represents both data and methodological triangulation. The findings from each data source and method are analysed together to enable 'convergence of evidence' and 'corroboration' using 'multiple measures of the same phenomenon' (Yin, 2009; Miles and Huberman,1994).

Reliability has also been strengthened in Project 2 by using informants that represent all the functions involved in NPD, including informants at Senior and Junior management levels. The informants also represent all the functions participating in the observed range review meetings and the focus groups. A reliability check of the findings is also carried out with three "external" brands.

With triangulation and reliability considerations, the data for the empirical induction work is collected using multiple methodologies and multiple cases. Four methodologies are

used; observing stage-gate review meetings, semi-structured interviews, focus groups and documentation. 20 hours of stage-gate review meetings are observed, in five brands, involving 56 participants. Nine and a half hours of interviews are carried out over 18 events, involving 26 participants. Three focus groups are held, involving 37 participants, for a total time of one and a half hours. Range planning and product category strategy documentation is also available from six of the eight cases.

In developing the FAC Framework, key findings are captured. It appears that different levels of FAC sophistication can be applied to the management of stage-gate NPD. These levels have been captured in the FAC Framework by presenting them as distinctly different and increasing levels of sophistication (Figure 3). The findings also suggest that applying a higher level of FAC sophistication could influence NPD management teams to improve portfolio value and strategic alignment. I also note in the findings that achievement of higher levels of FAC sophistication seems contingent on consolidation of the lower levels of FAC. A “FAC Metric”, productivity ratio, is also identified that provides practical guidance for NPD management teams in product selection to improve portfolio value.

To help provide answers to the overarching research question two propositions are developed in Project 2, based on the Project 2 findings, for testing in the action research study (Project 3):

1) *A change to higher levels of FAC sophistication influences NPD management teams to improve portfolio value.*
2) *A change to higher levels of FAC sophistication influences NPD management teams to improve strategic alignment.*

The specific purpose of the final empirical project (Project 3) is to observe how FAC influences NPD management teams, using a longitudinal field study that intervenes and changes the level of FAC sophistication in multiple cases and captures changes in portfolio performance. The findings of Project 3 are used to assess the two propositions noted above. This final empirical study of my research is discussed next.

3.6 Interventionist Empirical Study – Project 3

In this sub-section, the selection of action research as the Project 3 methodology is justified. The research process and design is discussed and also the approach for

checking the quality of the action research study undertaken. The key findings are noted that provide evidence for answering the research question; “How the use of FAC influences NPD management teams to improve portfolio value and strategic alignment”.

Firstly, the selection of action research as the methodology is discussed.

3.6.1 METHODOLOGICAL SELECTION

Action research was selected as the methodology for Project 3. Action research is a valuable methodology for carrying out interventions, observing how change happens, capturing outcomes and observing the effectiveness of the change. The methodology also enables testing of complex theoretical frameworks, developing and elaborating theoretical knowledge from practice.

I believe that you can only truly observe the characteristics of a control system if the control system is in operation. If the control system is not operating, it is like a radiator with a stuck valve. Most of the cases at pre-intervention were at low levels of FAC sophistication, levels 1 or 2, like “stuck valves” all at the same level. Also, as noted in the Introduction to this Linking Document, in the first empirical study I observe that NPD teams that apply higher levels of feedforward control sophistication have higher portfolio values and greater strategic alignment. This finding is an influential prompt to my selection of longitudinal action research for the final empirical study.

Longitudinal case action research can give a much better and rich understanding, especially to reveal the underlying generative mechanisms. Quoting Kurt Lewin; ‘if you want truly to understand something, try to change it’. Therefore I select longitudinal case action research for the final empirical study.

3.6.2 PROCESS AND KEY FINDINGS

Project 3 uses an interventionist, action research, qualitative longitudinal empirical study. The intervention approach with the NPD team as the unit of analysis, with six cases, is relatively “low-level” and involves the sequential presentation of graphical charts. These charts include the two frameworks developed in Project 2. The purpose of the intervention is increase the level of FAC sophistication applied in NPD and capture portfolio performance outcomes.

The quality of my action research is assessed using the Eden and Huxham (1996) ‘good quality’ action research checklist, their list of 12 ‘contentions’. I have compared the performance of my study against the contentions checklist (Appendix R) and the results suggest that the Project 3 study meets the standards of ‘good action research’.

There are four key components to the research design rationale (P3: Figure 36). Firstly there is the methodology used for data collection at intervention and in the following actions, post intervention, during the cycle of research, from one key product range NPD build to the next comparative product range, until the completion of the post intervention actions. I use Pettigrew et al.’s framework (1989); capturing context, process and content.

The second component, the “developmental process model” explains ‘how a sequence of events leads to some outcome’ (Van de Ven, 2007 p148). The focus of such a model is on the progressions of events or activities that the focal unit goes through as it changes over time and can be presented with ‘visual mapping’ (Van de Ven, 2007 p220). The model is used to help explain, when NPD management teams apply higher levels of FAC sophistication, how the generative mechanisms influence improvements in portfolio value and strategic alignment.

The third component is managements’ perception of the relationship between changing FAC Levels of sophistication and changes in performance. Understanding this outcome is at the core of the overall study research question.

The final component is the application of practical benefits tests on the FAC Framework, to provide reliability and triangulation on the contribution to knowledge of practice. The criteria selected for assessing the practical benefits of the FAC Framework are (Platts, 1993): Feasibility; can the framework be used; Usability; how easily the framework can be used; Utility; the usefulness of the framework. The design provides data triangulation for assessment of these practical benefits tests.

The design uses four research instruments (Figure 36); interviews, observations, documents and performance measures. The design also uses the two frameworks, the FAC Framework and the Portfolio Performance Framework, developed in Project 2, to guide data collection (Figure 36).

This study has used multiple examples of the unit of analysis, within the same organization and multiple methodologies. Intervention has taken place in six cases with capture of data on measures of portfolio performance. The key purpose for using multiple cases with multiple methodologies, with data captured in intervention and by semi-structured interview post intervention, capturing hard and soft metrics, is for data and methodological triangulation (Yin, 2009 pp114-116; Miles and Huberman, 1994 pp266-267) and to achieve coding and theoretical saturation, where no new categories are found (Partington, 2002 p151). The use of triangulation supports construct validity, which in turn improves reliability (Gibbert et al., 2008; Yin, 2009; Miles and Huberman, 1994).

The methodological approach, the multiple lenses, the rigour and triangulation have enhanced reliability.

The results provide evidence that supports the propositions, that the use of higher levels of FAC influences NPD management teams to improve portfolio value and to improve strategic alignment. First, I discuss the results on portfolio value.

3.6.2.1 Portfolio Value

The results provide evidence that supports the first proposition, that higher levels of FAC sophistication influence NPD management teams to improve portfolio value.

Firstly, the hard metrics results difference between the intervention and control cases is apparent. All the intervention cases increase the level of feedforward control sophistication levels and the portfolio values increase by an aggregate 14.6% and the portfolio productivity by 49.5%.This is in contrast to the control brands, with no observed change in feedforward sophistication, where portfolio values increase by an aggregate 7.8% and portfolio productivity decreases by 3.6% (P3: Table 15).

Secondly, 12 out of 13 informant managers in the intervention cases observed significant improvements in the ‘range structure performance’ measure and also product productivity. Range structure performance, in the Portfolio Performance Framework, is sub-categorized by the role of each product being justified, with no unnecessary complexity and that product duplication is avoided. Eight out of 13 informant managers in the intervention cases observed significant improvements in the soft measure of ‘objective informed decision-making’, categorized by management

acknowledgement of problems in the NPD portfolio, the improved management of escalation of commitment (Schmidt and Calantone, 1998, 2002) and more conviction and confidence in the overall range build. These results represent improvements in portfolio performance.

Thirdly, management perceive that there is a direct relationship between increasing the FAC levels of sophistication and improvements in NPD portfolio value. Management describe how 'going up the ladder' can be used to raise performance and that the intervention, metrics and 'quadrant mapping' has helped change portfolio value.

Fourthly, the Group COO and Group CFO, who review the performance of all the cases in the study as a key operational responsibility of their roles, note the post-intervention changes in NPD process controls and performance in the intervention cases. They observe the increased use of measures, in particular product productivity (the FAC metric). They observe improvements across all the intervention cases in 'sales, margin, overhead and cash', product productivity and the achievement of a 'margin dividend'. They note the improvement in NPD portfolio values in the intervention cases.

Next, I discuss the results on strategic alignment.

3.6.2.2 Strategic Alignment

The results provide evidence that supports the second proposition, that higher levels of FAC sophistication influence NPD management teams to improve strategic alignment.

In the Portfolio Performance Framework, 'cross-functional alignment' is a proxy for strategic alignment. Six out of thirteen informant managers in the intervention cases observe significant improvements in the 'cross-functional alignment' measure. This measure is categorized by the cross-functional NPD management team being 'joined-up at the big picture' and achieving a balance of goals across the different functional requirements. This result represents improvements in strategic alignment.

The results show that higher levels of FAC sophistication influences NPD management teams to carry out more collaborative, granular, product level, "bottom-up" forecasting, as well as forecasting at the total portfolio level. This forecasting activity also includes a simultaneous strategic "fit" check of the granular level product and the total category portfolio against the product category strategy and business strategy, as described in

FAC Framework level 3. These improvements in collaboration, cross-functional planning and goal congruence are improvements in strategic alignment.

As NPD management teams increase their sophistication in the use of FAC, they appear to increase the cross-checking between short-term targets and longer-term strategy, through the simple strategic “fit” validations at FAC level 3, uncertainty managed with scenario planning at FAC level 5, and target validation checks at FAC levels 6 and 7. Therefore there is evidence that higher FAC sophistication levels influence NPD management teams to better balance short-term and long-term product development needs and therefore improve strategic alignment (Baker and Bourne, 2014).

Finally, the Group COO and Group CFO note, across the intervention cases, a greater team approach, with more cross-functional involvement that is more ‘joined-up’ on portfolio performance.

This section has summarised the research process, methods and key findings in each stage of the research study. The next section discusses the findings and considers extant knowledge and the contribution to knowledge from the findings of this study.

4 DISCUSSION OF FINDINGS AND CONTRIBUTION

In this section I discuss the findings of my study and contribution. The domains and extent of the contribution are shown in the “Contribution to Knowledge Table”, as used by Cranfield School of Management (Table 1).

First I discuss what was known in extant literature, before my research, on the core concepts of this study. I note the gap in knowledge addressed by my research. Next I discuss the findings and contribution of my research. There is a contribution to theoretical knowledge, an empirical contribution and a contribution to the knowledge of practice.

When reviewing what was known before my study I discuss, in turn, the core concepts of portfolio value, strategic alignment and feedforward control in NPD. I also note that recent writers in the field are emphasising the need to understand the relationship between NPD control systems, portfolio value and strategic alignment. This is the gap addressed by my research.

Table 1 **Contribution to Knowledge** (Cranfield School of Management – Table)

Domains of Contribution	Extent of Contribution		
	What has been confirmed	**What has been developed**	**What has been found which is brand new**
Theoretical Knowledge			Different levels of feedforward control sophistication can be applied in NPD portfolio performance management.
Empirical evidence			1) A change to higher levels of FAC sophistication influences NPD management teams to improve portfolio value. 2) A change to higher levels of FAC sophistication influences NPD management teams to improve strategic alignment.
Methodology			
Knowledge of practice		A practical intervention “toolkit” that influences NPD teams to improve portfolio value and strategic alignment. The toolkit is feasible to use (it can be used). NPD teams find it has usability (it is used) and when it is used it has value and utility (Platts, 1993).	

4.1 Extant Knowledge and Gaps

To review extant knowledge I will start by discussing what the management control systems and the NPD literature say about portfolio value and strategic alignment being the key goals of NPD portfolio management. Next I discuss what the control literature says about portfolio value and strategic alignment. I also review what is known about the use of feedforward control in the performance management of NPD. I finish this sub-section noting the knowledge gap that my research addresses; that is "understanding how changing management controls in NPD portfolio management is associated with improvements in portfolio value and strategic alignment".

First I discuss the goals of portfolio management in NPD.

The NPD literature states that portfolio value maximization and strategic alignment are key NPD portfolio goals. We have known that management controls are required in stage-gate NPD for better performing NPD portfolios (Cooper et al., 2001b), though research focus in NPD has been predominantly at the product level, not at the portfolio level (Kester et al., 2011).

I note from my literature review that an outcome of effective portfolio management is a "balanced" set of products in the portfolio. Balance is achieved with the management of a competing set of parameters, such as short-term and long-term goals (Cooper et al., 2001a, 2001b). My literature review on management controls in NPD notes that effective product selection in portfolio management, where management evaluate trade-offs between competing requirements, achieves portfolio value and strategic alignment (Bisbe and Malagueno, 2009; Miller and Friesen, 1982; Akroyd and Maguire, 2011).

Next I discuss what was known on portfolio value.

From my review of extant literature I found that portfolio value is a key NPD goal. The literature says that management controls are used by NPD managers to identify the value contribution (Jørgensen and Messner, 2009), select profit maximising products, reduce wasteful developments (Bisbe and Otley, 2004; Simons, 1994) and evaluate trade-offs among products in the portfolio (Bisbe and Malagueno, 2009; Miller and Friesen, 1982).

Next I discuss what was known on strategic alignment.

One of the objectives of NPD controls is to achieve strategic alignment, where the NPD portfolio and allocation of resources 'mirrors the strategic priorities of the business' (Radosevich, 1977; Cooper et al., 2002; Akroyd and Maguire, 2011). Strategic alignment is achieved through cross-functional integration and co-ordination. NPD managers use management controls to satisfy the need to achieve this integration and co-ordination without stifling NPD (Cowen and Middaugh, 1988). NPD product selection should be the result of cross-functional input and involvement (Karlsson and Åhlström, 1997; Kester et al., 2011) and this cross-functional integration is significantly related to NPD performance (Davila, 2000). Management controls in NPD are used to improve strategic alignment through team consultation, collaboration and integrated problem solving (Bisbe and Otley, 2004).

Next I will discuss the role of feedforward control in NPD.

Feedforward control is an anticipatory control (Ishikawa and Smith, 1972) that involves 'future directed controls' (Koontz and Bradspies, 1972), focusing on strategic uncertainties (Bisbe and Malagueno, 2009) and can be used in product selection assessment (Jørgensen and Messner, 2009).The control can be used in NPD to reduce the likelihood of failure (Koontz and Bradspies, 1972). The management control systems and NPD literature suggests that feedforward control can help improve NPD performance. However, my systematic literature review did not find any study that explains how changing the level of sophistication of feedforward controls in NPD product selection is associated with improvements in portfolio value and strategic alignment.

It appears that little is known about how NPD managers approach the challenge of exercising control, reducing excessive and wasteful NPD outcomes, and simultaneously promote NPD experimentation, to maximise portfolio value (Richtner and Åhlström, 2010; Bisbe and Otley, 2004; Kester et al., 2011; Morris et al., 2006). This is considered an important area for study (Frow et al., 2005). To fill this gap in knowledge recent studies (Kester et al., 2011; Martinsuo and Poskela, 2011) encourage researchers to develop management control frameworks assessing NPD portfolios.

Recently writers in the field have emphasised the need to study short-term and long-term control criteria and to understand the relationship between NPD control systems, portfolio value and strategic alignment (Martinsuo and Poskela, 2011; Kester et al.,

2011; Lerch and Spieth, 2012). There was little research on the underlying mechanisms of NPD portfolio control and no research on how changing the sophistication of management controls in NPD portfolio management influences improvement in portfolio value and strategic alignment.

So, to summarise the literature; we know that a key objective of using controls in NPD portfolio management is to achieve the goals of portfolio value and strategic alignment. However, before my research:

- There was no research on how changing the sophistication of management controls in NPD portfolio management influences improvement in portfolio value and strategic alignment
- Little has been known about the underlying control mechanisms that NPD teams use to manage the challenge of exercising control and simultaneously promoting NPD experimentation, to improve portfolio value and achieve greater strategic alignment.

My research addresses these gaps in the literature, and in the next sub-section I discuss the findings and contribution from my study.

4.2 Findings and Contribution

My contribution address the gaps in knowledge, noted above. Firstly I discuss the contribution to theoretical knowledge, starting with different levels of FAC sophistication. This is a building step to addressing the gap on how changing the level of control sophistication influences improvement in portfolio value and strategic alignment.

Next, I discuss the empirical contribution which finds that when NPD teams apply higher levels of FAC sophistication it influences improvements in portfolio value and strategic alignment. In my research I also present the control changes that the NPD teams adopt post-intervention. The presentation of these control change mechanisms increases the validity of the finding that higher levels of FAC sophistication influence improvements in portfolio value and strategic alignment. This also addresses the second gap concerning our sparse knowledge of the underlying control mechanisms that NPD teams use to simultaneously achieve control and NPD experimentation.

The final contribution discussed is the contribution to knowledge of practice. This contribution is an intervention “toolkit” that can be used with NPD teams to achieve

higher levels of FAC sophistication and influence improvement in portfolio value and strategic alignment.

So, in the next section I start by discussing the contribution to theoretical knowledge.

4.2.1 FINDINGS AND CONTRIBUTION TO THEORETICAL KNOWLEDGE

The contribution to theoretical knowledge is in the management control systems sub-field of the performance management of NPD portfolios.

There is a gap in knowledge around how feedforward control in NPD portfolio management influences improvement in portfolio value and strategic alignment. To start addressing this gap requires an understanding of a particular important component of the overall gap. This component is the gap in knowledge that explains why a particular NPD team may or may not be using certain types of feedforward control in their NPD portfolio management.

In my study different NPD teams are observed using similar and different types of feedforward control. The use of different types of feedforward control is observed to have different influences on portfolio performance.

My study finds that NPD teams can apply different levels of feedforward control sophistication in NPD portfolio management and that different levels of sophistication have a different influence on NPD portfolio performance. My research develops a framework of eight different levels of feedforward control sophistication, the FAC Framework, that NPD teams can apply in portfolio performance management.

This framework is new and is a contribution to theoretical knowledge.

Now that we know NPD teams can apply different levels of FAC sophistication in NPD portfolio management, I can address and explain why changing to a higher level of FAC sophistication improves portfolio value and strategic alignment. I discuss this in the next sub-section on the empirical contribution.

4.2.2 FINDINGS AND EMPIRICAL CONTRIBUTION

I have found an empirical link between the level of FAC sophistication and portfolio performance that has not been demonstrated before. I found that when NPD teams increase the level of applied FAC sophistication there is a tendency to generate higher

portfolio values and greater strategic alignment. This empirical finding is a new contribution to knowledge.

My findings show an apparent difference between the portfolio value improvements of the intervention cases in comparison to those of the control cases. The intervention cases NPD teams observe significant improvements in portfolio performance and perceive that there is a direct relationship between increasing the levels of FAC sophistication and the improvements in NPD portfolio value. The Group COO and Group CFO observe improvements in portfolio values and significant improvements in portfolio productivity in all the intervention cases.

The intervention cases NPD teams perceive significant improvements in strategic alignment and achieving a better balance of goals across the different functional requirements. These NPD teams now carry out more structured, collaborative and granular level forecasting. The Group COO and Group CFO note, across the intervention cases, a greater team approach, with more cross-functional involvement that is more ‘joined-up’ on portfolio performance.

From this work I believe that when NPD teams increase the level of applied FAC sophistication there is a tendency to generate higher portfolio values and greater strategic alignment. I have identified the underlying generative mechanisms of the control changes adopted by NPD teams when moving to higher levels of FAC sophistication. The identification of these mechanisms increases the validity of my research and explains why the tendency exists.

This empirical link between FAC sophistication and portfolio performance is new and an empirical contribution of this study.

The next section discusses the contribution to knowledge of practice.

4.2.3 CONTRIBUTION TO KNOWLEDGE OF PRACTICE

The contribution to knowledge of practice is the use of an intervention “toolkit” that combines the action research study intervention approach with the findings of the process model and new analytics.

The use of the intervention toolkit influences NPD management teams to achieve higher levels of FAC sophistication applied in the NPD process. The use of FAC at

higher levels of sophistication has influenced NPD management teams to improve portfolio value and strategic alignment. Therefore the intervention approach, combined with the findings from the process model and examples of new analytics, provides a practical toolkit for intervention with other NPD management teams, in the context of managing large NPD portfolios, to improve portfolio value and strategic alignment.

The validity of this toolkit is increased by the NPD teams finding that the FAC Framework has feasibility, usability and utility in the management of the NPD process (Platts, 1993).

This intervention approach is new and represents a contribution to knowledge of practice.

The next section discusses the managerial implications.

5 MANAGERIAL IMPLICATIONS

The product range build is central to firm value creation, for firms with large complex product portfolios and short product lifecycles. Finding ways to better performance manage this activity is vital to long-term value creation. Therefore the findings of this study have valuable managerial implications, with commercial relevance and impact.

A key finding of the study is that when NPD management teams apply higher levels of FAC sophistication it influences improvements in portfolio value and strategic alignment. In my interventionist empirical study the difference in portfolio values between the brands adopting the FAC Framework and the three control cases, with no intervention, is apparent (Table 15). Combined with the findings from the developmental process model, this suggests that there is commercial relevance and impact with firm adoption of the FAC Framework as a guide to improving control in the NPD process, to influence improvement in performance, without stifling NPD experimentation.

The finding of the FAC Metric also has managerial implications. It can help guide NPD management teams in challenges on product selection. As a measure of product productivity, for example cash profit per product, it presents to management a measure of the design and development investment return achieved by each product.

Therefore the managerial implications of the findings of this study have commercial relevance and impact. The findings also provides evidence that suggests that the overall approach to this study, framed around the engaged scholarship model, and through undertaking a Cranfield DBA, has helped bridge the relevance gap in the use of management controls in NPD.

6 LIMITATIONS AND AREAS FOR FURTHER RESEARCH

This section discusses firstly, the limitations of the study and secondly, potential areas for further research.

6.1 Limitations

A number of limitations are identified; a single industry study, moderators that can affect FAC and contextual factors not controlled for in the research design.

There is a generalizability limitation given that the study has only been conducted in a single industry, the branded footwear and apparel industry. Research in other industries is required to enhance generalizability. An associated limitation is the relative innovativeness of the studied brands, which is predominantly incremental product development. Therefore increased generalizability also requires testing in predominantly high radical product development contexts.

The study also identifies, from the literature, moderators that could affect FAC. Many of these were controlled for in the research design. However not all the moderators could be controlled for in the design. To achieve a more complete understanding of the role of FAC in the management of stage-gate NPD requires study on the effect of changing all of these moderators. This study is limited by not testing for each of these moderators' effects when changing FAC levels.

A potential limitation is the presence of contextual factors that can effect performance, other than changing the levels of FAC sophistication. A number of such factors captured in this project were presented in the findings as having a significant improvement on portfolio performance but not related to changes in FAC Levels. I attempted to manage this in the design by using the three control cases.

These contextual factors show that there were other changes occurring, effecting portfolio value and strategic alignment, that I was unable to control for in the design.

This presents a limitation on the findings, especially for any claim on a relationship between changing FAC levels and changes in performance.

6.2 Areas for Further Research

Two significant areas for further research are identified. Firstly, studying how the combination of the Control Framework and the Performance Framework influences change. Secondly, to study the application of the combined Control ("Governance") Framework and Performance Measurement Framework in other key value-creating activities, other than stage-gate NPD.

The research design required two frameworks to collect key data, one framework to assess changes in FAC levels and a second framework to measure changes in performance, both in hard and soft metrics. In constructing the "developmental process map" (P3: Figure 63) a significant event is where the FAC Framework acts as a "roadmap" and the Portfolio Performance Framework sets a "vision". This finding suggests that the Performance Framework also has a role, in combination with the FAC Framework, in changing levels of management controls to influence management of the process and improve performance. This could be a significant finding, in that to achieve effective change two such frameworks may be required. Therefore this observation provides a potentially valuable direction for future research, on how the two frameworks work in combination to influence change.

This research opportunity leads to considering another potentially highly valuable direction for future research. The underlying theoretical assumption for the whole of this study is that changing the sophistication levels of management controls can influence change and improve performance. There may be other key value creating activities, other than NPD, where the combination of a management control sophistication framework and a performance framework can be studied to further test this theory. Improving the level, quality and sophistication of the management controls applied in a value-creating process can be defined as improving "governance" of the process. Where governance is describing how management control the quality and sophistication of the management controls being applied. Studying the application of a governance framework, in combination with a performance measurement framework, in other key value creating activities, could be a significant and highly valuable area for further research.

PROJECT 1

A Systematic Literature Review

ABSTRACT

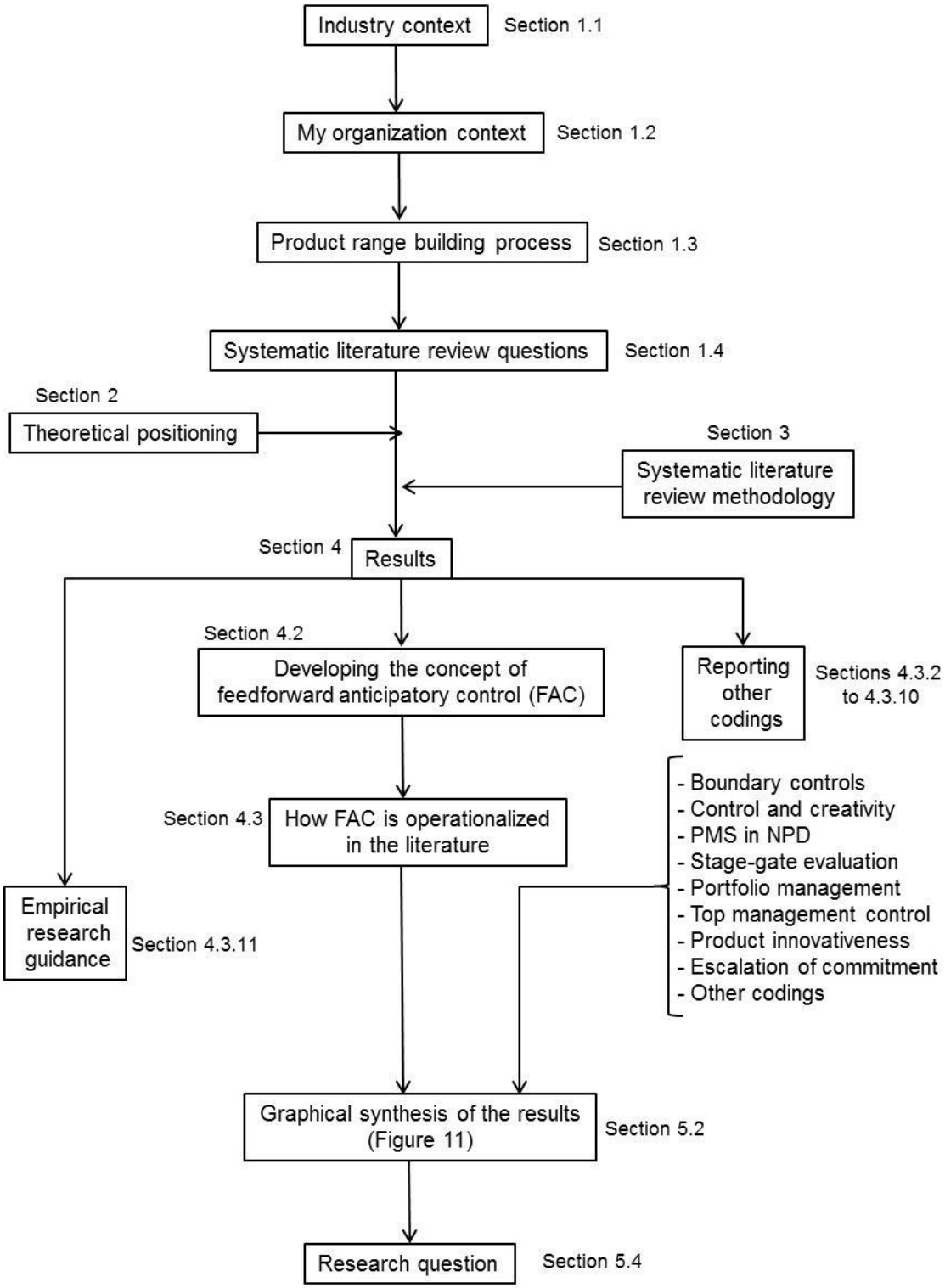
My scoping study has developed and identified a critical problem for the branded footwear and apparel industry; How can we better performance manage the product range build activity? This problem is developed further by applying management control systems theory to the control mechanisms used in the industry new product development (NPD) process. The resultant question for systematic review is: How do the following controls enable and constrain NPD; boundary controls and forecasting value outcomes (feedforward controls)? Systematic review was chosen as a methodology to comprehensively gather, analyse and synthesize extant literature in the fields of management control systems and NPD. 78 papers have been selected and 19 codings identified and the results are presented in a synthesized graphical model. The results confirm that feedforward anticipatory control (FAC) is an important control within the NPD stages and stage-gate process, operationalized at the stage-gates, with a significant mediating role at the critical point of management decision. A research question is developed from these results; How does the use of feedforward anticipatory control influence new product development management teams to improve portfolio value and strategic alignment?

The literature contains guidance on the empirical research methodology to address this research question, though the application of this methodology was not found in any published research in the systematic literature review. My first empirical project (Project 2) is planned to address these shortcomings, to understand how FAC influences NPD management teams. The application of this methodology and answering the proposed research question will provide a valuable contribution to the management control systems sub-field of the performance management of NPD portfolios. It will also provide managerial implications for addressing the performance management challenges of product range building.

1 INTRODUCTION

I have created a flow diagram (Figure 4) to provide a guide to the key sections of my literature review study. This diagram also shows the accompanying sections, which includes reporting of the coding.

Figure 4 Study Flow Diagram Guide



The introduction firstly considers the business problem, its contextual factors in the branded footwear and apparel industry, related macroeconomic developments and the specific context for my organization. Next, the product range build process, the activity at the centre of the business problem, is described. The literature Review Questions are discussed and presented and the rationale for using systematic literature review methodology is considered.

After the introduction I discuss the theoretical positioning and the systematic literature review methodology. The results are presented next. The key part of the results section is the development of the concept of feedforward anticipatory control and how it is operationalized in the literature. There is also a key section on the literature guidance for empirical research of management controls in NPD. I also present the reporting of the coding. The findings are summarised with a graphical synthesis and the research question is developed.

First I discuss the industry context and macroeconomic factors.

1.1 Industry Context and Macroeconomic Factors

My research is driven by a crucial and challenging business problem in the global branded footwear and apparel industry, developed and identified in my Scoping Study; How can we better performance manage the product range build activity? The product range build is central to firm value creation, where critical decisions are made that affect firm performance. The decisions made in the footwear and apparel new product development (NPD) process include; the product category priorities, the number of product styles developed in each category, design and styling, colours, construction, materials, branding applications, price points, target ex-factory prices from third parties, target channels of distribution and markets, country of manufacture and vendor selection.

There are macroeconomic long-term changes and industry context specific factors that are driving challenge and complexity in range building. These macroeconomic factors include increasing Chinese labour and production costs, reduction in Asian production capacity with a resulting transition from a brand “buyers” to a third party factory “sellers” market, material cost inflation, continuing Western economy footwear and apparel retail

price deflation and the lack of growth in Western economies. The challenging industry context factors comprise of demand that is dynamic and volatile, with low predictability and high uncertainty, short product lifecycles, high levels of product variety and product range changes and complex extended global supply chains (Fernie and Sparks, 1998: Bruce and Daly, 2004; Cao et al., 2008; Vaagen and Wallace, 2008). There are also further industry context challenges to achieving growth and sustaining profitability levels. These include sales growth dependence on opening new markets and new channels of distribution, managing increasing style variations across continents, looking for more responsiveness from extended supply chains and seeking preferred customer status with third party vendors to maintain security of supply.

The combination of the industry context and the developing macroeconomic pressures are placing further challenges on a brand firm's range build activity. Historically a brand firm has had relatively more financial freedom to 'throw stuff against the wall and see what sticks', being able to design and develop product ideas freely with little adverse impact on overall firm performance. Today a brand can no longer afford this approach because the general cost and impact to the firm of excessive and underperforming NPD has increased significantly. Ideas progressed in the NPD process need to have a higher likelihood of success and generally to perform better on portfolio and product productivity than at historical levels. When ideas are thrown against the wall nowadays, 'more needs to stick', and when it does, 'to stick better'. Therefore, finding ways to better performance manage the product range build activity is vital to long-term value creation for a brand firm.

1.2 My organization context

My organization has a portfolio of 13 brands operating in the branded footwear and apparel industry. Some of the brands are truly global, like Sport-One and Sport-Two, which sell product in over 140 countries around the world. Sport-One is a brand leader of swim related product and Sport-Two is one of the oldest sports brands, started in the 1930s. Product photographs from some of the key brands are shown in Figure 5.

Walk-One is an outdoor brand, predominantly with UK sales, now focused on growth in Asia and Europe, especially in Japan, Korea, China and Germany. Foot-H is a UK footwear brand, also sold in multiple countries, with significant growth in the USA.

Figure 5 Product photographs from brands within my organization's portfolio

Sport-One

Sport-Two

Walk-One

Foot-H

Fashion-Three

Fashion-E

Fashion-Two

The contextual challenges described earlier are clearly present in managing the product range build in my firm. The brands are targeting growth in many new markets and also in new channels of distribution, such as e-commerce. The brands operate with supply chains that extend around the world, with significant sourcing of product from Asia. The reduction in third party Asian manufacturing production capacity and the recent intensification of third party factories having more freedom to select brand customers, especially based on brand operational capabilities, is potentially impacting security of supply and product margins. In respect of building product ranges there is an increasing requirement to improve overall productivity, with a need to design and develop smaller ranges that have a greater sales impact. This is proving to be a difficult and complex challenge for NPD management teams. The business strategies are demanding greater product development for growth whilst the financial performance targets require improved management control to reduce excessive and wasteful NPD.

An additional organizational specific contextual challenge for my firm is that in having a portfolio of brands also exacerbates the demands on range building capabilities,

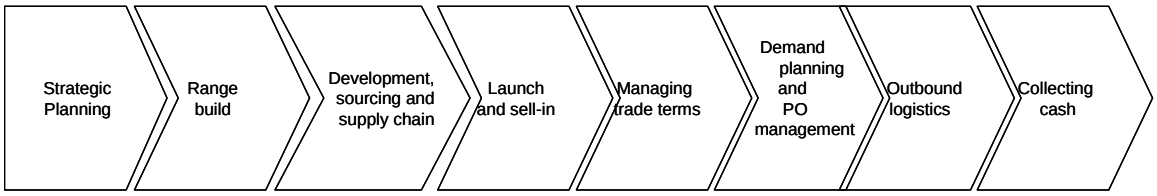
especially compared to an organization that has only one or two brands that may be operating in fewer market segments.

1.3 The Product Range Build Process

In the branded footwear and apparel industry the design, physical realisation of the product idea, manufacture and sale into the market usually follows a cyclical process. This process is often built around seasons, autumn/winter and spring/summer. Many brand firms are also selling product into the market on a more regular basis, to capture changes in fashion trends, looking to be more responsive as a means of growing sales.

This process cycle is shown in Figure 6. The first few stages of the process, from "strategic planning" to "launch and sell-in" are sometimes called "Concept to Launch".

Figure 6 "Concept to Launch" and "Sell-in"



The range build activity sits "upstream" in the process and decision-making is usually collective, dynamic and iterative, with new information entering the process being used to re-assess the product idea or specifications (Davila, 2000). Also, as is now common in many industries, NPD follows a stage and stage-gate process (Cooper, 1990). Typical stages within range build are; seasonal strategy planning, concept development, product specification development, physical sample development, final range review and launch to market. The output of the range build activity is the product range that the brand firm launches and sells into the market.

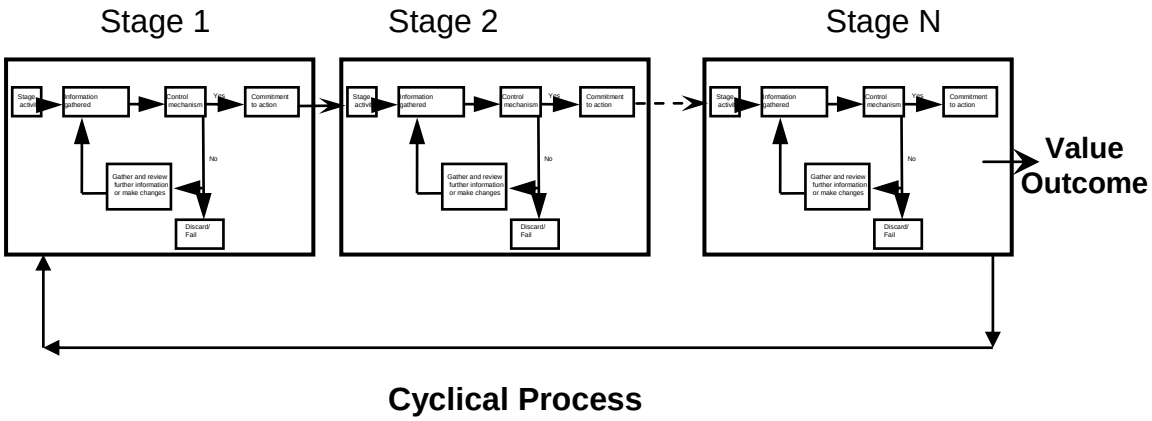
This process is managed by a NPD management team, typically consisting of cross-functional roles; Product Category Manager, Product Manager or Design Manager, Product Developer, Supply Chain Manager and Category Business Analyst.

From the product range build activity perspective, in the branded footwear and apparel industry, NPD can be defined as the creation or destruction of value, by managing product development change, using a sequentially staged cyclical process. This can also be considered as a definition for “innovation”, in the context of product range building.

I have designed Figure 7 to present the idea that product range building in the branded footwear and apparel industry is a sequentially staged cyclical process. At the start of the process, say Stage 1, the NPD management team assess a new product range plan. In the next stage NPD management may be considering whether the physical prototypes or samples meet plan requirements. In the penultimate stage NPD management teams will be deciding whether the developed product range is ready for launch to the market. The final stage is launch into the market.

Figure 7

Managing change in range building using sequentially staged activities (M Baker 2011)



At the end of each stage there is a stage-gate review meeting where management typically decide from three options; letting the product go through to the next stage, making changes to the product or “killing” the product. This process of stages and stage-gates is well described in the literature (Cooper, 1990, Cooper et al., 2002). In the branded footwear and apparel industry, when the end of the process is reached, NPD

management go back to the start of the process and begin again with a new seasonal range build. Whether value is created or destroyed by the NPD portfolio is determined, dependent on performance, when the product range has been launched and sold into the market. Portfolio value is measured by the realised profit from the products when the portfolio is sold.

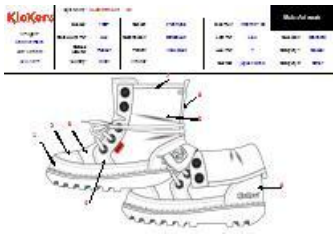
Figure 8 presents images from a footwear example of the sequential stages of product development in the range build.

Figure 8 A footwear example of the stages of the range build process

Concept Stage

Sketch Stage

Computer Aided Design (CAD) Stage



Specification Stage

Product Sample Stage

1.4 Development of the Review Questions and Rationale for Systematic Review

The identification of the Review Questions is developed by first considering that product range build is a system characterized by stages and stage-gates, where specific management controls are used by the NPD management teams to manage the NPD portfolio and performance. How NPD management teams measure performance in the

range build activity and the management controls they are using in the process, identified in the scoping study, also needs to be considered in developing the Review Questions.

To support the discussion a schematic of the use of the controls is also presented and discussed, adapted from the findings of Ishikawa and Smith (1972). This consideration leads to the conclusion that a management control systems perspective is the most relevant to finding constructive and valuable extant knowledge, from a systematic literature review, on the use of management controls in NPD.

Also noted is that the particular NPD context in this study has some distinct characteristics with regard to management controls and stage-gates. These characteristics are discussed in this section. Next, the two identified stage-gate management control mechanisms that are used in the range build process, “boundary controls” and “forecasting future value outcomes”, are used to determine the systematic literature Review Questions. Finally, the rationale for using a systematic literature review approach for literature review is discussed.

First, the stage-gate control “mechanisms” used by the NPD management teams in this particular NPD context are described.

1.4.1 Stage-gates and Control Mechanisms

At each stage-gate the NPD management team are reviewing product selection in the portfolio. In the branded footwear and apparel industry product selection is made using two control mechanisms or control systems. In terms of the product range build activity in this industry, this type of control is a system that mediates between information gathered and reviewed and the product selection (or commitment to action (Mintzberg et al., 1976)), usually into the next stage of the range build process. This control system, operating at each stage of the range build process, determines at the point of selection whether the new product project moves into the next stage, or it is discarded, or goes into further review if changes are required.

The controls used in the stages of the range build activity, in the branded footwear and apparel industry, have two key characteristics. Firstly there is the use of simple limits,

boundaries, levels or hurdles, which may or may not be pre-determined, using measures. For example:

- the product gross margin has to be greater than 40%
- the total number of style colour options (SCOs) must not exceed 200
- the quality of the prototype is below the agreed measurable standards.

Secondly there is the regular or continual use of evaluation and judgement that forecasts a future value outcome. For example:

- this product will create more cash profit than the other products
- this product is the more likely “winner”
- or strategically; product category Y will generate more profit than product category X over the next three years.

Combinations of both characteristics are also used, such as:

- this product category will hit its strategic growth target of Xm sales.

The second control mechanism is important given the branded footwear and apparel industry context of high unpredictability of demand and the dynamism of fashion trends. The breadth of managerial approach to forecasting future value outcomes can be described by the two ends of a continuum. At one end of the continuum the decision is made solely on judgement, intuition or experience, often based on the perceived aesthetics of the product. At the other end there is a variety of information and performance measurement that is also used. This information is in addition to the management judgement applied and informs the product selection. It can involve the assessment of sources of growth, strategic priority markets, channels of distribution and customers, performance of the current product range, performance of the vendor base (quality, delivery, cost), market trends, fashion trends and technology trends.

These two management controls, boundary controls and forecasting future value outcomes control, guide the next stage of the research, in that understanding how these controls enable and constrain NPD will be important to understanding how to improve range build performance and portfolio value. The next sub-section considers these measures of performance.

1.4.2 Performance and Performance Targets

A brand firm may use a variety of measures to assess performance and set targets. The business targets may be sales growth by volume and value, in new markets, sales growth in new channels of distribution or sales growth through new customers. There may be performance targets from growth in one gender over another (e.g. men versus women consumers) or some product categories more than others (e.g. footwear versus apparel, or subcategories e.g. jackets versus t-shirts). Improvements in product and product category profit margins may be a focus for performance improvement, with implemented changes in vendor, construction, materials or selling prices. Supply chain performance may target the on-time delivery of product to customers.

A key performance measure and performance target in range building is SCO (style colour option) productivity, which can be measured as unit volumes of sale per SCO or cash profit per SCO. A footwear product that sells 10,000 pairs per SCO is more productive than a product that only sells 1,000 pairs per SCO.

Another key measure is a conversion “hit” rate that assesses the number of product developments that are introduced into the range build activity compared to the number of those products that eventually achieve actual sales in the market place. If 100 developments go into the range building process and only 50 are eventually launched into the market and sold, the conversion rate is 50%. A conversion rate of 75% would be a better performance. However, in a fashion business there can be a concern if there is a very high conversion rate, where NPD management consider, from a strategic perspective, whether the brand may be “playing it too safe” and whether there is enough NPD experimentation to meet brand long-term growth plans and consumer requirements.

The ultimate measure of performance is the value that the NPD portfolio delivers, once sold into the market.

The next sub-section discusses an initial consideration of the use of management controls in the NPD. This also guides the theoretical positioning of the overall research study.

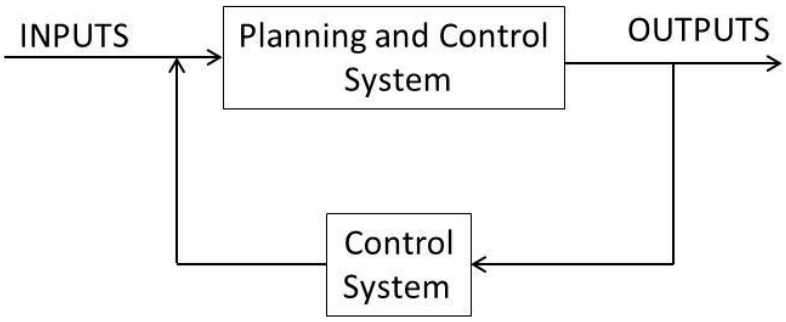
1.4.3 Management Control Systems, Systems and Control Theory, and Cybernetics

The use of the described control system in product range building in the branded footwear and apparel industry, “boundary controls” and “forecasting future values”, is an application of management controls within the NPD process. NPD management teams may or may not be using the control system to performance manage the outcome of the product range build and the value achieved from the NPD portfolio. A control system that uses feedback and feedforward information, as in the case of the NPD stages and stage-gates is the type of system depicted in cybernetics, systems and control theory (Wiener, 1950, 1953), and also in General Systems Theory (von Bertalannffy, 1950). The theoretical base is discussed further, in the section on theoretical positioning. This initial analysis concludes that the relevant fields of literature for systematic review are management control systems and NPD.

1.4.4 Schematic Representation of the Management Use of the Control

At each stage-gate of the NPD process there are inputs to the system, this may be information or it could be physical samples of product. The output of the system is a product selection, for example on whether a product is ready to go into the next stage or not. This relates directly to a typical feedback planning and control system as described in cybernetics (Wiener, 1950). A feedback planning and control system, adapted from Ishikawa and Smith (1972) is shown in Figure 9.

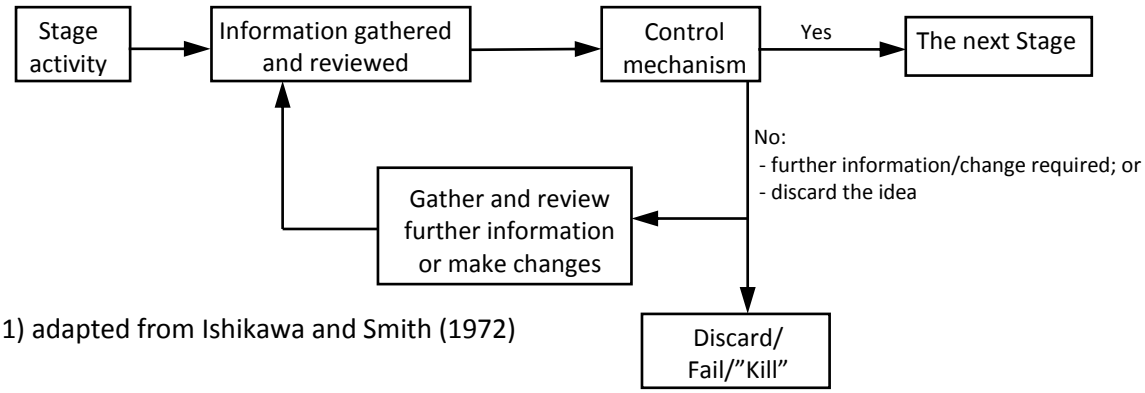
Figure 9 A feedback planning and control system, adapted from Ishikawa and Smith (1972)



I have further adapted this diagram to represent where the control system operates in the stage-gate review meeting within the NPD process of the branded footwear and apparel industry. This is shown in Figure 10. The three types of control result are

presented; product going through to the next stage, product requiring further changes or the product being “killed”. The key output of the control system is the product approval decision into the next stage of NPD.

Figure 10 The use of the control system at each stage-gate of the range build process



M Baker (2011) adapted from Ishikawa and Smith (1972)

Therefore the schematic shows where the control “mechanisms” of boundary controls and forecasting value outcomes are applied in the stage-gate product review meeting by the NPD management team. This idea and schematic helps crystallize the literature Review Questions.

Before discussing the systematic literature Review Questions it is helpful to consider the distinct aspects of NPD in this context, and the application of management controls at the Stage-gates.

1.4.5 NPD Context, Management Controls and Stage-Gates

The NPD context is an important and distinct perspective on the research of the proposed systematic literature Review Questions on stage-gate controls. Firstly the nature of stages and stage-gates defines specific fixed points in the system where the product selection is made using the controls. This is different from where such controls are used when there is no set or fixed point in a system or decision-making process, such as a stand-alone investment appraisal. More importantly, the stages and stage-gate process is sequential, where the use of the controls and the related product selection is applied at more than one single point.

The controls are applied at multiple sequentially occurring points in the process. In effect, the controls are being applied during the NPD process at multiple points, as input into multiple product selections, of which all these selections relate to one common action, the “go/no-go/kill” decision on the product going into the next stage of NPD. Another differentiating aspect of this NPD context is that these controls are used at all levels of the process, at the high-level strategic “front-end” product category level planning, at the lower level of the “seasonal” product portfolio and also at the lowest granular level, the single product. The controls are being applied at a strategic, tactical and specific product level throughout the NPD process.

The management controls within this NPD context are distinct and different in their application, given the use at fixed points in the system, with multiple application points during the process and at a strategic, tactical and granular product level.

The systematic literature Review Questions are discussed next.

1.4.6 Review Questions

The key performance management challenge within the business problem is how to enable NPD whilst maintaining a level of control. Given the central role of the management control system used in the described NPD process, and with a management control systems theoretical base, this challenge leads to the broad question of how do management controls enable and constrain NPD?

This leads into the need to understand how the two identified management controls, boundary controls and forecasting future value outcomes controls, enable and constrain NPD. This will be important to understanding how NPD management teams use these controls to improve the management of the product range build activity and therefore NPD portfolio value.

Therefore the developed review questions are:

1) How do the following controls enable and constrain NPD:
    - Boundary controls
    - Forecasting value outcomes?
2) How do they work in combination to enable and constrain NPD?

1.4.7 Rationale for Systematic Literature Review

The literature review is a significant component of any academic research project. Attainment of transparency in approach of search, analysis and synthesis, that is replicable, rigorous and scientific can be achieved by systematic literature review (Tranfield et al., 2003; Denyer and Tranfield, 2009). Systematic literature review is also an approach that seeks to minimise researcher bias.

It is important to my study that the research methodology is both rigorous in the search, review, data extraction and synthesis of available evidence and also succeeds in providing relevance to the practitioner community. Therefore to comprehensively gather, analyse and synthesize extant literature, in the fields of management controls and NPD, the next stage of research is ideally progressed by systematic literature review.

The remainder of the paper is structured as follows; firstly there is a discussion of the theoretical positioning of the work. Next there is a detailed presentation of the systematic literature review methodology applied, followed by a presentation of the results. There is a section on findings and discussion from the results and finally a summary and conclusions.

First, the theoretical positioning in management control systems is discussed.

2 THEORETICAL POSITIONING

This research study is in the field of management control systems theory. This mid-level theory sits within the “grand theory” of systems and control theory (Weiner, 1950; Von Bertalanffy, 1950).

The use of controls within social systems was first posited by Norbert Weiner (1950). Weiner conceived the science of cybernetics, the origin of the name noting the skill of a pilot or steersman. The word “governor” in a machine is derived from Latin/Greek for the word “steersman”. Wiener (1950) defines the principle of feedback as where “behaviour is scanned for its result, and the success or failure of this result modifies future behaviour”. Weiner is also attributed with the term “anticipatory feedback” which is recognising that when there are lags within a system corrections must be anticipated

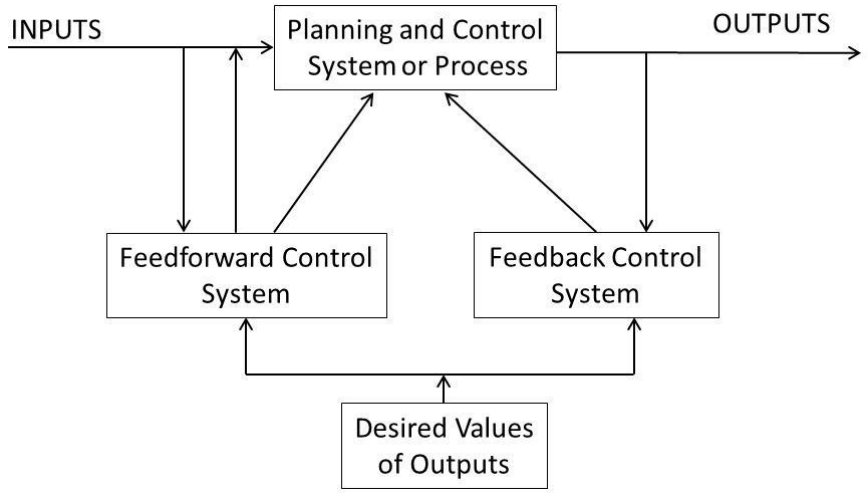
(Ishikawa and Smith, 1972). This theory proposes the use of feedforward controls in social systems.

Von Bertalannffy (1950), a biologist, discusses systems, the regulation of systems, open and closed systems, perpetual change in open systems and systems theory defining the general principles of dynamic interaction. He notes the use of feedback in communication and control within social systems. The theory advocates the use of systems thinking to understand the interaction of inputs and the environment and recognising the use of controls in the system.

The theoretical base for this research is management control systems theory and specifically the use of feedforward control within a systems feedback loop (Koontz and Bradspies, 1972; Ishikawa and Smith, 1972). The systems theory perspective assumes that there are inputs into the process, outputs of the process and that the monitoring of deviations from plan is captured in the feedback loop. In a feedback system the output corrections are fed back into the system or process. The feedforward control system feeds in additional correcting inputs into the process or system, before the outputs occur, to prevent unwanted or undesired variations (Koontz and Bradspies, 1972). This system is represented in Figure 11.

The two literature domains that the review questions cover are management control systems and NPD and the work in this paper is positioned on the use of feedforward controls in NPD.

Figure 11 Feedback and Feedforward Control Systems (Koontz and Bradspies, 1972)



A conclusion from this systematic literature review study is that the use of feedforward control by NPD management teams is important to NPD performance. However, since Koontz and Bradspies (1972) argued the importance of feedforward control in NPD, I have found no specific study of the application of the control, either theoretically or empirically in NPD. Importantly, I have not found any specific studies of how NPD management teams use feedforward control in NPD.

The findings and synthesis of the systematic literature review results identifies an important research question: How does the use of feedforward anticipatory control influence NPD management teams to improve portfolio value and strategic alignment? Exploring answers to this question will provide new contribution to knowledge of management control systems in the sub-field of NPD portfolio performance management.

Next, the systematic literature review methodology is discussed.

3 METHODOLOGY

This section describes the methodology applied; stages of the systematic literature review process, the review questions, people involved in the review, search strings and databases, inclusion and exclusion criteria, quality criteria, data extraction, synthesis and results presentation.

Review Questions

The questions for systematic literature review are:

1) How do the following controls enable and constrain NPD:
    - Boundary controls
    - Forecasting value outcomes?
2) How do they work in combination to enable and constrain NPD?

People Involved In the Review

Name	*Role*	*Involvement*
Mike Bourne	Panel Supervisor	Overall supervision and guidance of the Project

Colin Pilbeam	Panel Member and SRS	Development of systematic review questions, inclusion and exclusion criteria and extract data
Carlos Mena	DBA Cohort Leader	Sense check on paper structure, synthesis development and presentation of appendices
Heather Woodfield	Library information specialist	Sourcing of articles

Systematic Review Process and Stages

The process involved 12 key stages.

Stages:

1st : search of the databases (19th February to 6th March, 2011)

2nd : initial review of Stage1 papers to select Core Papers

3rd : selection of additional papers found while obtaining Stage 1 and 2 papers

4th : critical review of core papers and data extraction

5th : selection of additional papers from full core paper critical review references

6th : post full paper critical review and data extraction, coding development and coding saturation

7th : re-run of searches (18th May 2011)

8th : summary findings of data extracted on relevant empirical studies

9th : development of the results

10th : synthesis

11th : discussion of findings

12th: re-run of database searches (April 2013)

The stages were approached in sequential order. However, during Stage 4 a number of strong themes and factors were coming through from the data. Therefore the open coding development (Strauss and Corbin, 2008) began during Stage 4. Likewise during Stage 6, after the full paper reviews and the coding development, the ideas on synthesis were also being developed.

The key activities and approach for each stage are described next.

Stage 1: Search of Databases

Two databases were used, ABI/Inform Global and EBSCO Business Source Complete, which are two of the most comprehensive, extensive and widely used academic research databases.

140 papers were found in the Stage 1 search. Of the 140 papers, 21 papers were found in both databases, 84 papers solely from the ABI/Inform Global database and 35 papers solely from the EBSCO Business Source Complete database. These results confirm the requirement for using both databases.

In determining the search strings the Performance Measurement System (performance measurement systems) is considered a tool that is used in conjunction with management controls (Kaplan and Norton, 1992; Simons 1994, 1995; Neely et al., 1995). Therefore the search included performance measure related strings.

*Search strings (**Appendix A**)*

String	*Purpose*
manage* control* OR control* system* OR manage* system*	Management control systems
performance measure* OR performance manage* OR performance system* OR performance assessment OR performance evaluat* OR performance indicat* OR scorecard*	Performance measures and performance measurement systems
product develop* OR innovat* OR creativ* OR product innovat* OR initiativ* OR change	NPD, innovation and creativity
boundar* OR hurdle* OR limit* OR level*	Boundary controls

String	*Purpose*
feed-forward OR feed forward OR forecast* OR planning OR predict* OR scenario*	Feedforward controls and forecasting

The following inclusion and exclusion criteria were used in Stage 1:

Inclusion

- Peer reviewed journals
- Books within the selected paper references
- Studies of boundary controls and NPD
- Studies of forecasting, feedforward related aspects and NPD
- Studies of the combination of these controls/activities and NPD.

Exclusion

- The paper is purely financial or mathematically based
- The research only applies to public sector or non-profit sector
- NPD in the study does not in any way relate to the management of change through a process
- Functional focus, e.g.:
    - Human resource / personnel appraisal and evaluation systems
    - Low level manufacturing operational performance and control
    - Project management performance and control
    - Customer relationship management
    - Computer and IT systems
    - Quality and six-sigma
    - Environmental control systems
- The paper does not present any aspects related to the review topic
- Non English language.

Stage 2: Initial review of Stage1 papers to select Core Papers

The key quality criteria applied was that the papers had to be from peer-reviewed journals.

From the 140 papers found in Stage 1, 61 papers were selected as core, 13 as periphery and 66 rejected. The decision-making assessment for each paper is presented in Appendix B.

Stage 3:

Selection of additional papers found while obtaining Stage 1 and 2 papers

12 additional papers were found while obtaining the full text copies of the Stage 1 and Stage 2 papers. These papers resulted from having the same authors listed or similar topics in the full text retrievals. Of these 12 papers, six were selected as core, five as periphery and one rejected (see Appendix C).

Stage 4: Critical review of core papers and data extraction

The full paper critical reviews were done chronologically in Stage 4 to help better assess and understand the development of the fields under study. A critical analysis of each text was carried out using the method advised by Wallace and Wray (2006).

The following extraction data guide was used for each critical text analysis:

What is the date of the study?
Which journal?
What questions are the authors asking?
What theory are they using?
What methodology has been used to answer the questions?
What approach have they taken?
What are the details of the research design?
How have the authors used the study data?
What sector is being studied?
What is the context in which the control system is used?
What is the control system?
Who are the informants / population?
What are the characteristics of the control system?
What does the control system do? What is the actual impact of the control system?
What is the data that feeds into the control system?
How do the people in the study get feedback from the control system?

How does the control system enable and constrain innovation?
What is the guidance for practice?

Stage 5:

Selection of additional papers from full core paper critical review references

The additional papers found from core paper references are presented in Appendix D. The schedule shows which core papers have cited these additional papers. 16 papers were found, of which six were selected as core and ten as periphery.

By the end of Stage 5 the overall selected core papers for full critical text analysis numbered 73, 61 from Stages 1 and 2, six from Stage 3 and six from Stage 5.

An analysis of the selected papers, including the two additional papers found in Stage 7 is presented in Appendix F: 1,2 and 3. The key journals that the selected core papers have come from are; Journal of Product Innovation Management (twelve), Research and Development (R&D) Management (seven), Long Range Planning (five), Research Technology Management (four), Accounting, Organizations and Society (four) and Strategic Management Journal (four).

Stage 6:

Post full paper critical review and data extraction, coding development and coding saturation

Common themes and factors were grouped together, following an axial coding approach (Strauss and Corbin, 2008) and coded by paper, using the extraction data (Appendix G). 19 Codes were identified; Feedforward anticipatory control, boundary controls, control and creativity, use of performance measurement systems in NPD, stage-gate evaluation, portfolio management, top management control, product innovativeness, escalation of commitment, participative goal setting, core capabilities and rigidities, cost information effects, aspiration levels, strategic typology, risk behaviour, domain relevant knowledge, reward systems, cognitive analytical capability and research design.

A coding saturation schedule by paper is presented in Appendix H.

Stage 7: Re-run of searches

Given the time period from Stage 1 to Stage 6 (6th March 2011 to 18th May 2011) the search of the database was run again on 18th May. Two additional papers were selected, bringing the total number of papers selected for the study to 75.

Stage 8: Summary findings of data extracted on relevant empirical studies

Empirical studies of the use of management controls in NPD, identified from the full paper critical reviews, with feedforward findings were summarised along with extraction data; the research question, theoretical base, methodology, context and key claims. The resultant schedule is presented in Appendix I. 27 such empirical studies were identified and are discussed in the results.

Having established the coding saturation by paper it was a relatively simpler activity to capture the results discussion points, by coding, in a rigorous manner.

Stage 9: Development of the results

The results are presented in the next section.

Stage 10: Synthesis

The theoretical base for synthesis is a management control systems perspective (Koontz and Bradspies, 1972; Ishikawa and Smith, 1972; Ouchi, 1979), which involves depiction of sequential relationships between core constructs of inputs and outputs, where some constructs can have a mediating or moderating role and there exists a feedback loop. The results of the systematic literature review find that NPD management teams use feedforward anticipatory control at the point of product selection, in the stage-gate meeting, before going into the next stage of the process. The results also conclude that boundary controls are a component of the input construct going into evaluation. The results also depict a number of moderators in the process that, if present, will affect feedforward control at the point of product selection. The results suggest that presenting the findings in a graphical model (Whetten, 2002) is a useful way of describing emergent explanations of phenomena. This methodology has been used in developing the synthesised graphical model in Figure 12.

Stage 11: Discussion of the Findings

There is a findings and discussion section in this paper, after presentation of the results.

Stage12: Re-run of the database searches in April 2013 (Appendix E)

Prior to completing the overall thesis the database searches were re-run in April 2013. Ten papers were identified, three were categorized as “core” and seven categorized as “periphery”. This gave a total list of 78 core papers in the systematic review, with 28 empirical studies of the use of management controls in NPD.

4 RESULTS

First, the structure of how the results are presented is discussed. Next the concept of “feedforward anticipatory control” is developed from the results, its use in the coding of the results is explained and also its value in descriptively and more inclusively capturing the use of the control under investigation. Finally the results are presented based on the codings developed from the findings.

4.1 Structure of the Results

Initially, a feedforward control literature definition is presented. This definition is further developed by incorporating the systematic literature review findings of how feedforward concepts have been operationalized or considered theoretically in the relevant selected papers. Secondly, the argument is developed as to why the Review Question concept of forecast value outcomes is a form of feedforward control. Next the concept of feedforward anticipatory control is developed along with a discussion of why this concept is important for addressing both the business problem and also contributing to knowledge of controls in the performance management of NPD portfolios.

Post the critical analysis of the selected papers, key themes and factors were identified from the extracted data. These key themes and factors and the open axial coding development (Strauss and Corbin, 2008) are presented in Appendix G. 19 codes were developed and a coding saturation by selected paper is presented in Appendix H. This level of complexity in resultant coding is not surprising, given the multi-faceted nature of new product success (Griffin and Page, 1996).

The results are first presented in direct answer to the Review Questions; feedforward anticipatory controls and boundary controls. To provide structure and assist in explanation of the findings on feedforward anticipatory control use in NPD, the results on feedforward anticipatory control are separated into two parts. Firstly, a theoretical perspective and background is presented. Secondly, an analysis and findings from the empirical studies obtained.

Next, the other results are developed from the findings. The results suggest that a number of the identified codings, from a management control perspective, act as moderators when feedforward controls are applied in the NPD process. Some of the moderators identified apply to the information inputs and the cognitive evaluation activity.

The final part of the results is a presentation on the findings related to the "research design" coding, which is an important consideration for both this study and for guiding any future empirical work.

Overall, the papers with the most reported codings are:

- Simons (1994) [Five codings]
- Davila (2000), Cooper and Edgett (2003), Harmancioglu et al. (2007), Poskela and Martinsuo (2009), Francis (2009), Micheli and Manzoni (2010) [Four codings].

In the next section, the concept of FAC is developed from the results.

4.2 Developing the Concept of Feedforward Anticipatory Control (FAC)

In developing the concept of FAC, first a definition of feedforward control is presented. Next an explanation of the use of feedforward control as a replacement for the Review Question terminology of "forecasting value outcomes" is discussed. The last part of this section develops the FAC concept by presenting the operationalized or theoretical types of feedforward controls identified in the selected papers and combines these conceptualizations of the control with the feedforward control target validation loop of "double-loop learning" (Argyris, 1976, 1977).

First a definition of feedforward control, from the systematic literature review results, is presented.

4.2.1 FEEDFORWARD CONTROL – A DEFINITION

From its origins in engineering, feedforward control is an approach to address the time delay problems of feedback, where performance is fed back later into the system, after occurrence of the event, causing persistence of deviation from plan. Feedforward control monitors inputs and 'predicts the effects on the outcome variables' (Koontz and Bradspies, 1972). It has been defined as 'anticipatory control in which preventative action is taken before the difference between planned and actual performance occurs' (Ishikawa and Smith, 1972). The notable difference with feedforward systems is the timing of the control function and its association to the planning activity.

Using the findings from the systematic literature review of this study, the above definition can be further developed. The findings of the review have identified the operationalized or theoretical types of feedforward control used in NPD. These findings are detailed in Appendix J which presents a summary of how the authors of both the theoretical and empirical papers selected have identified or claimed the use of forms of feedforward control in NPD. These ideas and concepts have been summarised in Table 2 with the development of labels for each type of feedforward control.

These findings suggest that the definition of feedforward control can be enhanced by adding how the control is operationalized in NPD. Seven labels have been identified for how the control has been operationalized in NPD. These labels are anticipatory control, strategic value planning, scenario planning, forecasting, management controls and goal setting, evaluation and screening criteria and feedforward controls and metrics (Table 2).

The findings also show that these controls are applied in both formal and informal ways, with informal controls complementing formal controls. It has been found that management control mechanisms change from informality in the early stages of NPD to more formal behaviour as the project heads toward commercialization (Poskela and Martinsuo, 2009).

Table 2 Operationalized or theoretical types of feedforward controls identified or claimed in the selected papers

Feedforward Label	Type of feedforward control identified – by paper
Anticipatory control	Anticipatory feedback, anticipating deviations (Koontz and Bradspies, 1972) Anticipatory control (Ishikawa and Smith, 1972) Expected profitability of outputs (Godener and Soderquist, 2004) Expected outcomes (Holmes and Campbell, 2004; Poskela and Martinsuo, 2009) Anticipating needs and trends (Ciappei and Simoni, 2005; Kahn et al., 2006; Paladino, 2009; Barge-Gil et al., 2011) Attention focused on the strategic opportunity in terms of future business potential as anticipated by NPD managers (Martinsuo and Poskela, 2011)
Strategic Value Planning	Future directed controls (Koontz and Bradspies, 1972) Future profitability modelling (Nakahara et al., 1979) Futurity and strategy formulation, future orientation (Miller and Friesen, 1982) Long range plans and priority setting (Kanter, 1985) A focus on the return of new value (Rice et al., 1998) Strategic management accounting concepts related to profitability (Nixon, 1998) Strategic front-end integrated questions (Holmes and Campbell, 2004) Assessing lucrative market potential (Saunders et al., 2005)

Feedforward Label	Type of feedforward control identified – by paper
	Long-term strategic orientation (Kahn et al., 2006) A solid business case (Harmancioglu et al., 2007) Contribution to value (Marginson, 2002; Chiesa and Frattini, 2007; Jørgensen and Messner, 2009) Future value calculation analyses (Christiansen and Varnes, 2008) Strategic vision (Poskela and Martinsuo, 2010) Strategic performance measures (Micheli and Manzoni, 2010)
Scenario Planning	Preventing deviations from plan (Koontz and Bradspies, 1972) Evaluating plan prior to performance (Ishikawa and Smith, 1972; Radosevich, 1977) Weighing alternative courses of action (Miller and Friesen, 1982, Karlsson and Åhlström, 1997) Answering what-if questions (Makridakis, 1986) Mechanisms for evaluating trade-offs among NPD projects (Bisbe and Malagueno, 2009)
Forecasting	Profit forecast information (Nakahara et al., 1979) Extrapolating patterns in order to forecast (Makridakis, 1986) Forecasting future values (Makridakis, 1986) Importance of forecast data in control systems (Simons, 1987) Preliminary demand analysis and forecasting (Chiesa et al. and Noci, 2009)

Feedforward Label	Type of feedforward control identified – by paper
Management controls and goal setting	Constant evaluation of goals and activities (Burton et al., 1988) Proactively seeking goals which may be changing (Burton et al., 1988) Integration and simultaneous development of product and strategy development (Kortge and Okonkwo, 1989) Using Levers of Control for strategy renewal (Simons, 1994) Using management controls to obtain information needed to reduce uncertainty (Nixon, 1998) Management controls used to control the strategy process (Marginson, 2002) Use of interactive control systems to select profit maximising initiatives (Bisbe and Otley, 2004) Specific and challenging goal setting at the explorative front-end of innovation (Poskela and Martinsuo, 2009) Interactive management and accounting control systems have a focus on strategic uncertainties (Bisbe and Malagueno, 2009)
Evaluation and screening criteria	The nature of decision-making in the NPD “funnel” (Karlsson and Åhlström, 1997) Innovation screening criteria (Rice et al., 1998) Stage-gate “should meet” criteria (Cooper et al., 2002) Portfolio management solutions that evaluate, rank, prioritize and focus on fewer but better NPD projects (Cooper and Edgett, 2003) Tough rigorous gates with robust and visible go/kill criteria (Cooper and Edgett, 2003)

Feedforward Label	Type of feedforward control identified – by paper
	Readiness stage-gate criteria, “proceed with confidence to the next stage” (Holmes and Campbell, 2004) Use of interactive control systems to “filter” excessive innovation (Bisbe and Otley, 2004) NPD evaluation criteria (Saunders et al., 2005) Highly visible formal stage-gate strategic emphasis go/kill criteria (Kahn et al., 2006) Stage-gate criteria and the use of feedback control and feedforward control (Jørgensen and Messner, 2009)
Feedforward controls and metrics	NPD reliance on feedforward controls (Langfield-Smith, 1997) Feedforward metrics set up before NPD project launch (Godener and Soderquist, 2004) The formalization of the R&NPD process with integration of feedforward performance measures (Godener and Soderquist, 2004) Balancing financial and non-financial indicators, or lagging and leading indicators, can generate both feedback and feedforward loops (Micheli and Manzoni, 2010)

Next the replacement of the term “forecasting value outcomes” with feedforward control is discussed.

4.2.2 FEEDFORWARD CONTROL AND FORECASTING VALUE OUTCOMES

From the results presented in Table 2, it can be concluded that forecasting value outcomes has the feedforward control characteristics represented by the feedforward labels of forecasting and strategic value planning. The study of forecasting by Makridakis (1986) specifically refers to the term ‘forecasting future values’ in

combination with the use of scenario planning. Therefore it can be concluded that forecasting value outcomes is another conceptualization of feedforward controls used in NPD. Furthermore, this concept is being applied in the business problem context as an application of management controls, both formal and informal, used by NPD management teams as a control system in the NPD process. Given that 'forecasting value outcomes' covers at least two of the feedforward labels identified and that the concept is being used as a control system within NPD, it is valid for this study to adopt the broader concept of feedforward control as a replacement term.

Next, the concept of feedforward anticipatory control is developed.

4.2.3 FEEDFORWARD ANTICIPATORY CONTROL

Using the feedforward labels developed in Table 2 as a guide, when considering the business problem context of NPD in the branded footwear and apparel industry, NPD management teams use a number of these feedforward control concepts. There is the use of anticipatory control, where management may or may not anticipate the future market performance of the planned product range. This has been described in the literature as 'expected outcomes' (Holmes and Campbell, 2004; Poskela and Martinsuo, 2009). Management may or may not anticipate whether the outcome will meet business targets or plan. Management are therefore using management controls, whether formal or informal, to evaluate goals and activities in order to reduce uncertainty (Burton et al., 1988; Nixon, 1998; Bisbe and Malagueno, 2009).

Targets, plans or activities may or may not change, contingent on the anticipated performance outcome. This management control mechanism, in the NPD context, is therefore also using the concepts of forecasting, strategic value planning, and management controls and goal setting.

Whether the NPD management team may or may not be validating portfolio value targets, is also a form of a feedforward control loop. This is where management question goals, targets and objectives, known as "double-loop learning" (Argyris, 1976, 1977).

I am looking for a more inclusive description of the use of feedforward controls in NPD that combines the concepts of anticipatory control, with the feedforward aspects of forecasting and planning, and with double-loop learning. I have created the concept of "feedforward anticipatory control" (FAC) to more broadly capture this use of feedforward controls by NPD management teams, in the NPD context.

It is this developed concept, of FAC, that has been used in the coding of the systematic literature review results.

Next, the results of the systematic literature review are presented.

4.3 Systematic Literature Review Results

Initially, the results are presented in direct answer to the review questions; FAC and boundary controls. The results are next presented in decreasing rank order of coding saturation findings (Appendix H). The results next presented are; control and creativity, use of performance measurement systems in NPD, stage-gate evaluation, portfolio management, top management control, product innovativeness and escalation of commitment. The remaining codes discussed are cost information effects, cognitive analytical capability, participative goal setting, core capabilities and rigidities, aspiration levels, strategic typology, risk behaviour, domain relevant knowledge and reward systems. Finally a section on the "research and design" coding is discussed.

4.3.1 FEEDFORWARD ANTICIPATORY CONTROL

The FAC coding within the findings represents the bulk of the coding occurrences from the systematic literature review (43 occurrences out of 142 in the coding saturation, Appendix H). The findings related to this coding represent a substantial and significant part of the results. The results contain studies that represent a theoretical framework and background and also studies that are from empirical research, specifically on NPD, that have feedforward control findings. Therefore, to aid presentation of the results, this results sub-section on FAC is presented in two parts. The first part discusses the findings from the theoretical papers found in the systematic literature review and the second part discusses the findings from the empirical NPD research papers.

Overall the selected studies clearly show that the use of FAC by NPD management teams is crucial to the performance of the NPD portfolio, though no specific theoretical or empirical study was found in the systematic literature review that describes how this control is used in NPD portfolio management. The results also present how the different studies have operationalized or identified the types of feedforward controls used in NPD.

The FAC findings from the theoretical papers are presented first.

4.3.1.1 Theoretical framework

The theoretical studies on the role and use of FAC have identified the origins of the control and the importance to overall firm performance management. This has included the role of feedforward control, the role in planning and control systems, setting priorities and long range planning, the concept of “steering”, the use of forecasting and the use of management controls in NPD. These theoretical studies are discussed in this sub-section.

The initial theoretical papers on feedforward control discuss the origins and definitions. It has been argued theoretically that managing through feedforward “future directed” control is important since the past cannot be altered or changed, that using only feedback performance information is not adequate, and therefore for control to be effective it should be directed at ‘preventing present and future deviations from plan’, anticipating deviations from objectives (Koontz and Bradspies, 1972). It is further posited that feedforward control is a method for regular review of goals and that it would be a useful control for achieving NPD targets (Koontz and Bradspies, 1972). This systems and control perspective on managing firm performance originates from cybernetics (Wiener 1950, 1953), with the proposed concept of “anticipatory feedback”.

Feedforward control is defined as “anticipatory”, in that it takes action preventatively to avoid differences in planned and actual performance, which is important in an increasingly dynamic environment (Koontz and Bradspies, 1972; Ishikawa and Smith, 1972). It is further argued that the control should be aimed at the relationship and formalized integration between the planning system and the control function (Ishikawa and Smith, 1972; Radosevich,1977). Using a theoretical study of formal systems

appropriate for innovative organizational units it has been argued that flexibility in formal systems is a desired characteristic which can enable better management of unanticipated important events (Radosevich, 1977). The magnitude of risk and uncertainty should be recognized in the formal planning, control and information systems of innovative units and that comprehensive performance measures are used that are consistent with firm goals. Such controls should provide a 'hierarchy of responses' to plan deviations (Radosevich, 1977). Therefore, feedforward control is an anticipatory control that can assist in managing uncertainty, help avoid deviations from plan or re-assess the viability of targets.

Priority setting and long range planning is considered vital to NPD. From the entrepreneurial model perspective, using the oil-drilling analogy of getting more 'drilled-holes' delivering results, the focus on innovation is helped by management setting the priorities ahead and developing long-range plans (Kanter, 1985). These claims are in-line with the key findings of the Product Development and Management Association (PDMA) NPD practice research (Griffin, 1997) where best practice firms are more likely to start with a 'strategy step' in their NPD processes.

The concept of "steering" has been introduced, defined as 'a managerial process that consists of planning, tracking, controlling, assessing and re-planning, while simultaneously interacting with the environment on a continual basis'. The core element being the constant review and establishing of goals where managerial control is designed to impart confidence that the firm is on track with its plans, a key characteristic of feedforward control (Burton et al., 1988).

A theoretical study has referred to addressing "what-if" questions and the forecasting of 'future values', similar to the terminology used in the review question of this study (Makridakis, 1986). A theoretical investigation on the role of management controls and innovation highlights the importance of feedforward control for "defender" innovation mode firms. Defender firms carry out little NPD and have limited product ranges (Langfield-Smith, 1997).

These studies on anticipatory control, priority setting in long range plans, steering, forecasting future values, addressing "what-if" questions, the use of management

controls in NPD, acknowledge the importance of the use of feedforward anticipatory type controls to help manage uncertainty and performance, especially in the management of NPD.

The next section presents the results of studies on feedforward controls in empirical NPD research.

4.3.1.2 Feedforward controls in empirical NPD research

This section presents the systematic literature review results for empirical NPD studies that have feedforward control findings. The review findings show that FAC has been operationalized in NPD as future profitability evaluation, forecasting value returns and lucrative market potential, future orientation and environmental scanning, market orientation anticipation of customer needs, management controls application of interactive controls, “front-end” strategic planning and feedforward metrics. All these findings confirm the important role of FAC in the management of NPD.

From the 78 selected papers, 43 had FAC related findings and of the 43 papers 28 were empirical studies (Appendix I). Of these 28 studies, reviewing the methodologies used, 14 are based on questionnaire surveys, seven on single company case study, seven on multiple firm qualitative study and one on a government database (Spain – SBSS). Of the seven multiple firm qualitative case studies, only three have a sample proportion with branded consumer goods firms in the study. No specific example was found, of a multiple case study investigation of NPD with feedforward control findings, with a focus on the branded consumer goods sector. The significant bulk of case study work has been on industrial firms.

In reviewing the “theoretical” bases applied in the empirical studies, 17 of the 28 studies did not present any theoretical base. The most used theoretical base has been Simon’s Levers of Control framework (Simons, 1994), with five studies (Appendix I). The remainder of the studies have each used a separate theoretical perspective; organizational market information processes; concept of uncertainty; open-systems perspective; appropriated decision-making; enabling formalization; NPD process – stages and stage-gates.

The empirical NPD studies with future profitability evaluation and market potential assessments are discussed first.

4.3.1.2.1. FUTURE PROFITABILITY EVALUATION, RETURN ON NEW VALUE TO THE MARKET AND MARKET POTENTIAL

The following specific NPD studies have investigated the use of future profitability evaluation, the use of feedforward metrics such as value returns and also the identification of lucrative market potential as significant feedforward screening criteria.

Based on practices in Sumitomo Electric in Japan in the 1970s, on evaluating R&D projects future profitability, it is argued that profit forecast information and future profitability modelling should always be accessible to project managers (Nakahara et al., 1979). In a substantial study of 27 projects over a diverse set of large USA companies it was found that the 'screening' of discontinuous, breakthrough innovations is characterized by a focus of questions on assessing the 'return of new value to the market' and an evaluation of the magnitude of the forecast benefits. By contrast, when investigating continuous, incremental innovation it was found that screening is characterized by the measure of 'return to the firm', which considered profit impact and pace of growth (Rice et al., 1998).

Forecasting market potential has also been identified as a feedforward control in NPD. A 172 respondent questionnaire survey, across 314 new product projects, from a good mix of FMCG firms, studied how screening criteria changed during the NPD process. The study concludes that the two most significant criteria, out of 32 identified dimensions, were both related to market potential; 'compelling market size potential' and 'lucrative market potential'. The latter dimension was the only criteria applied throughout all the stage-gates of the NPD process (Saunders et al., 2005). In a quantitative synthesis, 41 studies, meta-analysis of the NPD literature (Henard and Szymanski, 2001) it is argued that the most significant drivers of new product performance are: market potential, 'predevelopment task proficiency' and customer needs being met by the new product.

Profit forecasting, financial forecasting and anticipating a lucrative market potential are all facets of feedforward measures and control that are used in NPD evaluation.

Other “future” and marketing orientations of empirical NPD feedforward findings are discussed next.

4.3.1.2.2. SCANNING, FUTURE ORIENTATION, MARKET ORIENTATION AND CONCEPTUAL INFORMATION UTILIZATION

Other NPD studies have used different designations, such as environmental scanning, future-orientation, marketing orientation techniques and conceptual information utilization which describe the characteristics of FAC.

“Future orientation” and environmental scanning have feedforward control characteristics that have been observed in empirical NPD research. Using a questionnaire survey research study of 52 Canadian firms, representing a wide variety of industries, it is claimed that the ‘more future-oriented’ the firm the more serious the firm focus on change and therefore the influence on NPD (Miller and Friesen, 1982). It is also claimed that “scanning”, the activity of gathering information from the environment, including competitor product comparison details, combined with “futurity” (future-orientation) will have a significant influence on organizational innovation. Future oriented control is also important in the identification of the potential risk of too much innovation, especially in the entrepreneurial business model where a ‘bold’ approach is taken to innovation (Miller and Friesen, 1982).

The importance of market research and a marketing orientation to support feedforward control in NPD has also been examined. In a theoretical paper substantially using Robert Cooper’s research, it is asserted that to reduce NPD failure rates in industrial products a systematic process should be adopted that simultaneously integrates a review and evaluation of both strategy and product development and that the NPD process requires the input of greater marketing orientation to determine product viability (Kortge and Okonkwo, 1989). There are claims that market orientation enables firms to learn from customers and allow anticipation of latent needs, and therefore helps the firm develop continuous market relevant innovation. There are also associated tentative claims that a higher marketing orientation achieves a higher financial performance impact (Paladino, 2009). In a meta-analysis of new product project performance literature, it was found that strong marketing orientation was a key factor in realizing

higher performance of NPD (Pattikawa et al., 2006) and that R&D and marketing 'integration' has a large effect size on innovation performance.

The importance of market research customer preference elicitation techniques to help predict the degree of risk in the early stages of product development has been noted (Helm et al., 2004) and a longitudinal case study of ICI bulk chemicals business in the 1980s, shows how ICI approached this sort of new product project evaluation using Multi Criteria Decision Making. By applying multi criteria decision making attribute structure word models with attribute weights a claimed transparency of NPD project judgement and evaluation was established. This method was found to effectively communicate preferences in difficult NPD project decision making (Islei et al., 1990).

A marketing research information oriented study made claims on detecting emerging environmental opportunities and the relationship in anticipating the response in NPD. The study focuses on organizational marketing information processes, using a questionnaire survey of 92 firms, with VPs of Marketing as respondents, and claims that competitive product advantage is associated more with how a firm makes best use of "knowledge asset", ambiguous and complex information than whether the firm has the information (Moorman, 1995). The processes of conceptual information utilization are argued to be potent predictors of new product performance, with information utilization and competitive advantage being linked. From a feedforward perspective, such conceptual information is in the detection of emerging environmental opportunities and developing the creative responses anticipated by the change. However, there is the risk that such information can also hamper creativity because it can interfere with the solution generating ability of the organization (Moorman, 1995).

Strategy review, marketing orientation, customer preference elicitation and Multi Criteria Decision Making in NPD, all exhibit the use of FAC in the management of NPD.

Empirical studies of management controls in NPD are discussed next.

4.3.1.2.3. MANAGEMENT CONTROLS AND NPD

The studies described in this sub-section are investigating the use of management controls in NPD. The findings note the use of scenario planning, the utilization of

forecasting in management controls for NPD and the application of interactive controls in NPD. All these observations further confirm the important role of FAC in the management of NPD.

In one of the rare empirical longitudinal studies on management controls in NPD the role of anticipatory scenario planning is considered critical. A two and a half year longitudinal single case study of an international, European based, electronic office equipment manufacturing firm offers practical guidance on managing the process of changing product development strategy and finds that when a new product project develops from idea to reality it involves the crafting and assessment of different options, requiring market issue responsibility across the functions and the evaluation of NPD goals (Karlsson and Åhlström, 1997). It is argued that in a product development strategy this planning stage is crucial; targeting business segments, the level of product innovativeness required and innovation objectives. These are all characteristics of FAC.

For “prospector” firms, defined as those firms that compete through NPD and market development, an empirical study of 76 Canadian firms, of which 32 are prospectors, it has been claimed that high performers associate great significance to forecasting in their managerial control systems (Simons, 1987). They place importance on tight goal setting and careful monitoring of outputs. Simons (1987) defines control as a formalized system, using information to ‘maintain or alter patterns’ in the activity of the organization. The work of Simons (1987) and Langfield-Smith (1997) suggests that feedforward control is important in NPD irrespective of the strategic typology of the firm, whether defender or prospector.

Simons (1994), in his paper on how new top managers use Levers of Control for strategic renewal, describes four control levers; belief systems, representing core values; boundary systems, to avoid risks; diagnostic control systems, which are the critical performance variables; interactive control systems, for managing strategic uncertainties. Based on an empirical study of ten diverse USA firms, focusing on newly-appointed top managers, Simons argues that formal management controls focus ongoing attention to strategic ideas, initiatives and innovation. Also, in respect of ‘future vision’ these control systems emphasise organizational learning on strategic uncertainties. The role of these Levers of Control in NPD have recently been studied

(Marginson, 2002; Bisbe and Otley, 2004; Chiesa et al. and Noci, 2009; Bisbe and Malagueno, 2009; see Appendix I). The findings suggest a relationship between FAC and Simons' Levers of Control in that both are used in managing uncertainty and performance in NPD. These studies are discussed next.

The recent empirical NPD research using Simons' Levers of Control framework as a "theoretical" base for study have emphasised the role of interactive control systems, especially in the highly uncertain early stages of an NPD project. The findings on initiative selection criteria, filtering out of excessive NPD and the use of forecast demand analysis all relate to the application of FAC.

The first of such papers describes a longitudinal qualitative single case study of a UK telecoms firm claiming that an increasing use of management controls influences 'human endeavour' in a firm. The management control mechanisms described include the use of value systems, administrative controls and key performance indicators (Marginson, 2002). The author notes that how management controls effects new idea development is little understood.

A study on the effect of interactive control systems on NPD, using a questionnaire survey with 58 CEOs of medium sized Catalonian Spanish firms, makes feedforward control related claims. Firstly, that interactive control systems possibly form emerging patterns of action in highly-innovative firms, for search preference signalling and also the selection of initiatives and secondly, that these controls provide focus by the application of 'filtering', which curbs excessive and unnecessary NPD. This is argued to improve overall NPD performance (Bisbe and Otley, 2004).

Another investigation looked at the choice of interactive controls under three different innovation modes; intuitive, simple and isolated innovation; systematic, project-by-project approach; strategic, considering innovation initiative interrelationships. The study claims that interactive controls focus on strategic uncertainties and that tentatively the choice of management accounting and control system (MACS) is associated with the type of innovation mode followed by the firm (Bisbe and Malagueno, 2009). Using a case study of two Italian home automation firms, each firm with two radical innovation projects and two incremental innovations, the authors argue that irrespective of how

innovative the project, forecasting and initial demand analysis is always required. In noting these feedforward characteristics, the authors also observe the dependence on interactive control systems, especially in the early stages of radical innovation when uncertainty is very high (Chiesa et al. and Noci, 2009).

All these studies with findings on the use of interactive systems in feedforward control suggests a relationship between them in managing uncertainty and performance, especially in the context of NPD.

Overall, these management controls and NPD studies find that FAC has a significant and important role to play when used within the firm planning and control system. This role encompasses curbing excessive and wasteful NPD and simultaneously the management of uncertainty and performance.

The systematic literature review results from empirical “front-end” NPD studies are presented next.

4.3.1.2.4 “FRONT-END” OF NPD AND FEEDFORWARD CONTROLS

This section discusses NPD empirical studies that have focused on the “front-end” of NPD and findings are presented that have feedforward characteristics.

The role of the Product Innovation Charter has been assessed (Bart, 2002) where the findings show that highly used product innovation charter elements include non-financial and financial performance objectives. Another study on three case ‘histories’, finds that the strategic front-end NPD questions focus on the value opportunity and confidence evaluation when considering moving forward to the next phase of development. A proposed operationalization of the key stage-gate question is presented as ‘are you ready to proceed with confidence into the next phase?’ (Holmes and Campbell, 2004). Holmes and Campbell also use a definition of “process” that is close to that used in the development of the review questions of this study; ‘a structured set of activities organized to deliver value to the end customer of the process’.

The use of challenging goals at the explorative front-end of NPD to drive higher performance and the crucial nature of management controls to understand market and

technology uncertainty has also been identified (Poskela and Martinsuo, 2009) using a questionnaire survey of 133 Finnish industrial companies. The use of market, technical and strategic criteria, in idea and concept evaluation at the front end of innovation, is especially beneficial in achieving future business potential (Martinsuo and Poskela, 2011).

These results confirm the crucial importance of FAC at the front-end of product innovation and in NPD.

Discussed next are the systematic literature review results of feedforward controls from a NPD process perspective.

4.3.1.2.5 NPD PROCESS AND FEEDFORWARD CONTROLS

The NPD studies in this section reveal feedforward characteristic findings that have adopted a process perspective in the research questions. These studies note the application of risk management evaluation criteria at the stage-gate, anticipated value generation, the importance of feedforward customer orientation, the use of solid business cases, the need for flexibility of evaluation judgement in assessing ambiguous future preferences and the need for better up-front planning at the concept development stage. All these findings represent the use of FAC in these NPD studies.

In a study of the stage-gate process, using extant NPD process literature, claims are made that firms, which are more advanced in NPD process, recognize that these critical junctures are essentially ‘risk management modelling’ at the point of product selection and the important evaluation criteria are strategic: Is there product advantage?; The market attractiveness?; Risk versus return? (Cooper et al., 2002). With a feedforward viewpoint, it is claimed that it is crucial to integrate product portfolio management at the stage-gate, assessing whether the balance and number of product projects is right, if there is strategic alignment and whether there will be sufficient value generated. The findings of this study seem particularly relevant to the business problem at the centre of my overall research study.

An investigation of the NPD processes of the Montebelluna sports shoe cluster in Italy, using a 20 firm respondent questionnaire survey on companies that manufacture and

distribute their own sports shoe brands claims that to anticipate early the emerging trends, these firms need to proactively grow close relationships with their customer base and understand their requirements. That is the need to have a feedforward customer orientation to improve NPD performance (Ciappei and Simoni, 2005).

An investigation that explored the use of business cases, customer input and customising the stage-gates of the NPD process to help safeguard growth plans, based on 13 face-to-face in-depth interviews over three case studies in the US building materials industry, concluded that to reduce uncertainty in product development required the formalization of procedures. The study also concluded that the use of both a solid business case and customer input is positively related to competitive intensity (Harmancioglu et al., 2007).

In examining decision-making behaviour in new product portfolio management meetings, it has been observed that flexibility is required in the decision-makers project evaluation judgement against the 'ambiguity of future preferences'. It is also claimed that this flexibility in judgement is positively related to the construction of future value calculation analyses (Christiansen and Varnes, 2008).

A study of the status and future improvement actions of the private label (PL) NPD process in Asda, the UK grocery retailer, reviewed 283 new products over a 21 month period and identified that the successful Asda suppliers had better planning and activity preparation and used 'front-end homework' between the stages of concept formulation and the decision to develop, by conducting technical, financial and market assessment (Francis, 2009). There was also significantly more success for those suppliers adopting high marketing orientation. The importance of 'voice of the customer' and having a strong marketing orientation, is highlighted by the PDMA (Francis, 2009).

The findings from all these studies reinforce the important role that FAC has in the NPD process, with the application of value creation and risk management assessments of new product concepts. How the NPD portfolio is managed at the stage-gates, by the NPD management team, that achieves strategic alignment and sufficient portfolio value, through the use of FAC, seems crucial to understand to be able to answer the business problem identified in my scoping study.

Next, the systematic literature review results of performance measurement in NPD, that have feedforward characteristics, are discussed.

4.3.1.2.6 PERFORMANCE MEASUREMENT, FEEDFORWARD CONTROL AND FEEDFORWARD METRICS

This section presents the findings on studies of performance measurement and NPD that have feedforward related findings. These studies show that feedforward metrics provide feedforward control in anticipating value creation in research and NPD (R&NPD) decision-making.

A qualitative single case study of a firm designing and developing casting machines for non-ferrous metals discusses how the firm established commercial viability before incurring substantial costs on investigating the new project idea (Nixon, 1998). The key assessment undertaken was the anticipated impact on profit and market share. The early phase of development was characterized by the greater use of qualitative strategic measures in between the stages of idea generation and concept development.

A study of R&D measurement in three large French electronics firms examined the use of feedforward metrics and found that the metrics were established prior to project launch and considered feasibility, risks, expected profitability, meeting customer needs and strategic competitive positioning. Many of these measures were given a quantitative evaluation. A key claim of the study is that by integrating these measures, which have feedforward characteristics, within a formalized research and NPD process, the quality of the launch decision is “guaranteed”, assuming the targets are realistic (Godener and Soderquist, 2004). This claim appears to be an example of how to provide more confidence at the product selection point and assist in anticipatory control.

From a multiple case study of eight Italian technology intensive firms, it is claimed that the critical performance dimension for performance measurement systems in R&D is the anticipatory evaluation of contribution to value (Chiesa and Frattini, 2007).

In considering the role of strategic performance measures, it has been identified that the active function of strategic performance measures is to present innovation

strategies, balancing financial and non-financial metrics, with indicators that are both lagging and leading, generating ‘feedback and feedforward loops’(Micheli and Manzoni, 2010).

These studies show the significance of the use of feedforward control and feedforward metrics in NPD.

The next sub-section presents the remaining systematic literature review results on other empirical NPD studies with feedforward control aspects.

4.3.1.2.7 OTHER NPD STUDY PERSPECTIVES AND FEEDFORWARD CONTROL

The following NPD studies, highlighting feedforward findings, investigate research questions from a variety of other perspectives compared to the previously presented results; the adaption of management controls to product development strategy, an NPD resource management view, the balancing of efficiency and effectiveness and lastly, how some firms still succeed in NPD without investing in R&D. All these studies also confirm the importance of the use of feedforward control in the performance management of NPD.

An investigation into how management controls are adapted to product development characteristics with a study of 11 medical devices firms and 56 questionnaire respondents, with hypotheses developed from case studies of 12 business units in seven companies finds that the design and use of management controls is related to product development strategy and uncertainty, such that alignment of management controls and product strategy is markedly related to performance. The strong feedforward characteristics are in how the control system helps reduce market uncertainty and manage performance, for example with the application of focus on customer information input, rather than using management controls for the monitoring type of control (Davila, 2000). However, the study also notes that management controls are much less use in technology-related uncertainty and that the literature on the use of management controls in NPD is ‘sparse’. Another finding of this study is that management controls design and use is positively related to NPD performance.

Using a NPD resource management perspective it was found that the key solutions offered to the problem of having too many projects were essentially feedforward and anticipatory in nature. The suggested solutions included the requirement to apply more 'growth oriented' metrics, strategic planning mapping, innovation strategy that considered the strategic 'arena' and goals and ranking valuation in new product portfolio management (Cooper and Edgett, 2003).

A 16 month field study of a Danish food processing control systems division, investigating the balancing of efficiency and effectiveness within an NPD context, identified the feedback and feedforward control aspects of the stage-gate and development stages process. The study also observes the use of expected contribution margin as a feedforward control metric (Jørgensen and Messner, 2009). This recent paper comments on how little research there is on management controls for NPD practice.

Another recent paper examining how firms that do not undertake formal R&D investment are still sources of innovation, uses the Spanish Ministry of Industry and Public Enterprise Foundation database (SBSS), with 6,500 observations from 1,300 firms. The study concludes that in constantly changing markets, with reducing product lifecycles and rapid innovation, the anticipation of technology trends and the evaluation of market opportunity implications are critical to performance. The study advocates this type of structured feedforward approach as a valuable decision support (Barge-Gil et al., 2011).

These studies show that the use of customer information input to reduce NPD uncertainty, strategic planning and value creation potential ranking and the anticipation of trends, are all operationalized examples of feedforward control used in the management of NPD.

4.3.1.2.8 SUMMARY OF THE EMPIRICAL NPD STUDIES WITH FEEDFORWARD ANTICIPATORY CONTROL FINDINGS

These specific NPD studies with FAC findings have further confirmed the important role of using feedforward control in managing NPD. The observed FAC has been operationalized as future profitability evaluation, with the use of feedforward planning

measures, assessment on return of new value to the market, environmental scanning, the use of management controls in NPD and front-end strategic planning.

The next sub-section summarises the systematic literature review results on FAC.

4.3.1.3 Summary of Feedforward Anticipatory Control Findings

In summarising the literature on FAC use in NPD it is clear that it has a significant and important use in the performance management of NPD. The operationalized or theoretical types of feedforward control found in the literature on NPD studies are anticipatory control, strategic value planning, scenario planning, forecasting, management controls and goal setting, evaluation and screening criteria, and feedforward metrics (Table 2).

The literature relating to FAC in NPD suggests that this anticipatory control operates, at whichever particular stage-gate in the NPD process, between the point of evaluation and the product selection taking the development into the next stage of the process. It is logical that the NPD management decision taking the product past the stage-gate into the next stage of the NPD process, is taken after the activity of product evaluation (Figure 12). The product selection decision should not be taken before evaluation is completed. Therefore FAC has a mediating role. When the NPD management team has made the stage-gate evaluation and are at the point of decision, FAC is the key control in operation, at the point of decision, determining whether the project should be allowed to go through to the next stage, be “killed”, or altered.

The literature review in this study finds that, since Koontz and Bradspies (1972) argued the importance of using feedforward control in the performance management of NPD, no specific empirical study of the application of the control has been found and, importantly, no studies have been found of how the use of FAC influences NPD management teams.

Next the systematic literature review findings on boundary controls are discussed.

4.3.2. BOUNDARY CONTROLS

The few studies found on boundary controls and NPD have focused on their use in combination with other controls. It appears that the application and use of the boundary control by itself is straightforward but it is in combination with other controls, providing the capability to enable control and creativity, that has been of interest to scholars.

As discussed in the previous section, boundary systems are one of the four Levers of Control claimed by Simons (1994, 1995) that are used by top managers for managing strategic renewal and uncertainty. Simons describes their role as a control to avoid risks and are used in conjunction with belief systems to overcome organisational inertia, by having constraints around the strategic initiatives domain whilst enabling creativity and innovation. Simons observes that boundary systems are usually stated in negative terms or in 'minimum standards' and are used to implement and clarify rules and limits to which the organization must adhere. The combination of diagnostic and boundary control systems has been found to be crucial for 'hard' targets and belief and interactive control systems for 'soft' objectives (Chiesa et al., 2007b; Simons 1994,1995).

Likewise a recent study, using a qualitative study of four companies in different industries, notes that the firms relied to a great extent on the combination of diagnostic and boundary systems at the 'front-end' of innovation. This was evidenced by management control mechanisms on targeting, directive briefings and rewards (Artto et al., 2011). This is slightly contrary to Simons (1994, 1995) in that Simons considers all four levers of Control to be important in balancing creativity and control, especially boundary controls in combination with belief systems. Another recent paper argues that only a few metrics and indicators should be applied in dynamic environments, mostly to 'set boundaries' (Micheli and Manzoni, 2010).

There were no studies found in the review that specifically focused on the role of boundary systems and NPD. The limited findings from the extensive systematic search suggest that the use of boundary controls and metrics are reasonably clear and straightforward, though the interesting question for practice perspective is whether they are applied or not. What is significant from the review findings is that the role of boundary systems is considered in conjunction with the other Levers of Control. This presents the limited extant literature findings in addressing the second review question

of how feedforward and boundary controls work in combination to enable and constrain innovation.

From a management control perspective, when the NPD management team is evaluating the information inputs, prior to the decision point, the literature suggests that boundary controls are a component of that input (Figure 12).

The next sub-section discusses the systematic literature review results on the concept of “balancing” control and creativity.

4.3.3 CONTROL AND CREATIVITY

The next highest coding occurrence (19 occurrences out of 142) is control and creativity. Early studies have investigated the use of organic and mechanistic systems on innovation performance and the consistent underlying theme in this area is the effect of the level of formality of management control on creative output. The next phase of studies identifies the problem of control formality from both ends, “tight’ mechanistic controls at one end to “loose” organic mechanisms at the other. In more recent studies both extremes are found to harm innovation performance, too much formality constraining innovation and too little formality, with excessive innovation, adversely impacting overall firm performance. This suggests that a “balance” is required between control and creativity to maximise performance. Therefore this also suggests that formality of management control acts as a moderator on the use of FAC.

Mechanistic versus organic control has been debated in studies on R&D, where organic systems are described as having broad control spans and loose and flexible organizational structures that stimulate creativity (Holt, 1970). It is argued that a key driver towards the organic approach is product complexity, with observations that it is the tension between the workings of an organic system against the requirements for specification clarity and adherence to control systems that is an important consideration. Having more flexibility in formal management control to facilitate innovation and consider uncertainty was posited by Radosevich (1977), whilst controls that stimulate innovation needs in ‘conservative’ firms, can also be controls that curb NPD profligacy in ‘entrepreneurial’ or ‘prospector’ firms (Miller and Friesen, 1982; Langfield-Smith, 1997).

One study finds that the control and innovation relationship is greater than the one between environmental scanning and innovation, suggesting that solid performance control information is more difficult to 'explain away' or rationalize (Miller and Friesen, 1982). The use of a partnership governance system or 'mutual adjustment model' for control of the entrepreneurial innovation process, where negotiation and shared adjustment amongst participants is required has been proposed. The risk being that when innovation is not valued enough the administrative management control dominates, which pushes out the entrepreneurial approach (Kanter,1985). These early studies recognise the effect of control formality on NPD performance.

Most of the next phase of research focuses on how too much formality in management control constrains NPD. The stifling of creativity by excessive formality of controls has been noted in studies on the problems of effective planning and control systems. It is observed that there is a requirement for NPD management to develop formal control systems that are able to satisfy co-ordination and integration and also enable creativity (Cowen and Middaugh,1988). Referencing the work of Peters and Waterman (1982) who conclude their book with a chapter on 'simultaneous loose-tight properties', Cowen and Middaugh advise the use of a few 'tight' controls and many 'loose' controls, to stimulate entrepreneurial activity through a high degree of autonomy and simple organization, yet having rigid performance controls in place. In considering the managerial imposition of directives and behavioural constraints on NPD performance it has been claimed that research is still needed to understand when excessive detail hinders performance and when the level of planning is relevant (Davila, 2000).

Criticism of the ability of budgets and planning to inhibit creativity and innovation has also been investigated in a case study of a large technology sector multinational corporation, employing 60,000 people world-wide. This sector has significant challenges in firm attempts to establish high levels of strategic 'adaption' and at the same time have tight budgetary controls. The study examines how the formal deployment of management control procedures managed the tension between strategic renewal and budgetary control and found that teamwork, shared accountabilities and mutual interdependencies between managers, across co-operative 'boundary-spanning activities' occurred within the organization to provide innovation flexibility (Frow et al,,

2005). The authors also claim that budgetary control can stifle innovation because it can prompt individualism, risk aversion, and dependence on hierarchy, which are the flipside characteristics for firm creativity. Similar findings on 'strict formalized' controls were made by Wynder (2007). These studies highlight the risks of having management controls that are too tight or of too high a formality, resulting in the stifling and constraining of NPD. This finding is important in my research on how the use of FAC influences NPD management teams, in that the control will be considered effective if it does not stifle creativity and NPD.

The next stage of investigations examined more the benefits as well as the risks around management control formality. The 'complex patterns of loose and tight controls' used in NPD was investigated in a study using 29 in-depth interviews with business unit managers from ten large North American firms with claims that managers engaged in NPD need to consider the importance of formal controls, the role of informal controls and the balance in applying loose and tight controls (Bart, 1993). Control was defined as 'the set of procedures, systems and actions that managers use to monitor, evaluate, influence and/or define what their subordinates are doing'. An additional contingent complication was identified, in that different types of product strategies required variable levels of control, for example NPD that was currently unrelated to the existing products of the firm, or NPD that was 'imitating' competitors, represented more risk and therefore required greater formal control. Whereas, in contexts where firm NPD output is low, it is argued that excessive control can hinder innovation (Bart, 1993).

It is also argued that formal management controls are important to manage both revolutionary and evolutionary initiatives and innovation (Simons, 1994) where Levers of Control ensure continuing management attention to, and effective communication of, innovation strategy, whilst focusing learning on future uncertainties (Kimura and Mourdoukatas, 2000). It is also suggested that top managers trying to encourage significant innovation and strategic renewal can use the controls to set demanding targets, to represent substantial improvements in performance, address complacency and bring a sense of resolve (Simons, 1994).

In a single case longitudinal study of the Italian Autostrade's Telepass system development in the 1990s, the findings showed that the interactive use of management

controls stimulates innovation, with the controls taking a mediating role between the innovation, its different contexts and the environmental challenges (Revellino and Mouritsen, 2009). The study also notes that extant literature proposes the management controls influencing role on NPD but there is no detail or specification of how this occurs. The conclusion from these studies is that the application of management controls in NPD can help obtain a balance between creativity and control.

To better understand this relationship between control and NPD more recent studies have used the perspectives of dynamic control and also Simons Levers of Control framework. An investigation into dynamic control and innovation, under dynamic capability theory claims that dynamic control mechanisms can indicate to management how to integrate mechanistic (tight) or organic (loose) organizational 'couplings' or 'interlocks'. The argument being that the greater the uncertainty, the lower the interlock or organizational dynamic control mechanism coupling, and vice versa (Park, 1998). Dynamicity is defined as 'inherent risk or uncertain implications' for the organization and that such dynamic environments present substantial challenge for programmed innovation. It is also claimed that successful development and launching of market distinctive products can be achieved through the interactive use of formal management controls.

This formal use of management controls may also reduce risk of excessive NPD in high-innovating firms (Bisbe and Otley, 2004; Simons, 1994). It is also claimed from the same study (Bisbe and Otley, 2004) that NPD efficiency and product effectiveness decisions are eventually improved by the interactive use of management controls because of options evaluation, consultation, collaboration and cohesive solving of problems. These studies reinforce the finding that in applying management controls in NPD requires a balance of control formality to ensure the desired performance results of both creativity and control.

Recent studies have been more focused on this balancing of creativity and control. A study of the relationship between entrepreneurship and control, with a questionnaire survey of 162 US firms, from a variety of industries argues that the entrepreneurship mode presents a challenging predicament for control efforts. On the one hand the purpose of management controls are to reduce risk, assist goal alignment and decrease

uncertainty, whereas entrepreneurship encourages risk tolerance, stimulates the management of uncertainty and develops initiative experimentation (Morris et al., 2006). The concern is raised that when the control focus is on efficiency it becomes a substantial obstacle to effectiveness and study findings provide evidence for the conceptual depiction of control as a 'multi-dimensional construct', especially when different levels of formality and the tightness of budgets can be distinguished (Morris et al., 2006).

It is suggested that care is taken in using management controls to avoid the innovation 'traps'. It is argued that this can be achieved by loosening process controls that are too tight, widening new ideas search, willingness to risk failures and avoidance of developing too many inconsequential products (Kanter, 2006). The management challenge is finding the balance between control and the autonomy required for flexibility, innovation and knowledge-creation (Richtnér and Åhlström, 2010). In a study of three USA strategic business units (SBUs), it was found that the more dynamic and uncertain the environment the more centralized the control structure, with creativity obstructed by high intervention and close monitoring in business case implementation (Harmancioglu, 2007).

The extant literature identifies that a "balance" is required between control and creativity to maximise NPD and firm performance. Overall, these findings demonstrate that formality of management controls has a moderating role in the NPD process and suggests that this specifically applies where feedforward control is used at the point of product selection at stage-gate review.

For FAC to improve NPD portfolio performance it simultaneously needs to curb wasteful product development but not stifle it. FAC should reduce risk, assist with strategy and goal alignment, decrease uncertainty and at the same time encourage risk tolerance and experimentation (Peters and Waterman, 1982; Simons, 1994, 1995; Davila, 2000; Bisbe and Otley, 2004; Morris et al., 2006; Richtnér and Åhlström, 2010).

The next systematic literature review result coding discussed is the use of performance measurement systems in NPD.

4.3.4 USE OF PERFORMANCE MEASUREMENT SYSTEMS IN NPD

The studies of performance measurement systems use in NPD have investigated the types and use of measures, how the use of measures changes during the NPD process in the different contextual stages, strategic performance measures use in NPD, the characteristics of NPD that make performance measurement difficult, observations of too much NPD focus on feedback measures, the performance measurement systems use in NPD benefits of knowledge build-up and communication and also attempts to identify the key metrics for use in R&NPD. The findings show that, from a systems and control perspective, performance measurement systems is an input into the NPD process, and the use of performance measurement systems in NPD acts as a moderator on these inputs (Figure 12).

The first set of studies identified in this coding have examined the types and use of measures in R&D processes. These include feedforward and feedback metrics, measures used in the early stages for managing uncertainty and more specific metrics in the later phases of development and key financial and non-financial measures. A set of metrics has been proposed for growth performance targets of NPD; desired growth rates (volume, market share, profitability), growth potential and expansion potential (prospects for product and market expansion) (Ramsey, 1981). It has also been argued that performance measurement for R&D requires ‘systematic’ evaluation and that measures limitations need to be understood (Cordero, 1990). A model has been proposed that makes estimates in the R&D planning stage and takes corrective action at the feedback control stage, though it is claimed that some critical output features cannot be quantified and qualitative measures should be used to overcome these limitations. This particular study also observes that managers still use measures, even though they are known to be inaccurate, as control tools and for flexible planning in R&D, to reduce uncertainty. The study concludes that managers use these measures as a structure for ordered decision-making (Cordero, 1990).

A paper reporting a number of R&D measures used in a casting machines single case study reports some measures that have feedforward characteristics; driven by customer needs, strategic orientation and a balance of financial and non-financial metrics. The longitudinal study reveals measurement change over the development process, with

‘softer’ criteria used in the early stages and eventually, in later stages, information is used that has much greater reliability and specificity (Nixon, 1998).

An exploratory investigation examined NPD performance measures and management control issues (Hertenstein and Platt, 2000) involving an 18 month study, with industrial design managers in eight large firms, in companies noted for their superior design capabilities. The study captured the perspective of the design managers. The findings showed that these managers, responsible for NPD, were concerned that the use of financial measures alone inadequately reflected their contribution to NPD outcomes. The identified cause was that outcome performance measures are monitored after product launch, in a period after the design managers have completed their task. The observed result was that in using measures to reinforce the link between strategy and NPD, it often motivated management control changes, though the design managers realized it was very important to communicate results to senior management in both financial and non-financial terms. The study results showed that the key financial measures used were product and process cost and the key non-financial measures were customer satisfaction metrics. The authors argue that greater emphasis should be placed on design and competitive strategy alignment for performance measurement systems used in the management of NPD performance.

These studies described so far have found that the measures used in NPD change over the process, from the point of concept up to launch into market and into the post commercialization stage. The observations being that the early stages of NPD use metrics to help manage uncertainty, with an emphasis on strategic performance measures, while in the later stages of development the measures are much more specific. To meet these requirements the NPD process uses both financial and non-financial measures.

The following set of research investigations have concentrated on the use of strategic measures and the characteristics of the NPD process that make such performance measurement problematic. The use of performance measurement systems creates substantial tension in strategy development processes, with the use of a range of key performance indicators in the key strategy process areas to safeguard minimum standards of performance (Marginson, 2002).

The use of a measurement system generating significant performance improvement in a diamond processing firm's applied research group (Loch and Tapper, 2002) involved the application of a 'spider' or 'radar' diagram. It was claimed that this approach dynamically guided research efforts by reviewing parameter targets for those parameters considered to be more important in the period ahead. These findings indicate the feedforward use of such measures, as targets within the 'radar' tool. The research also notes the importance of the measures system, reported in the case study, as a communication instrument for priorities and ambition, in reflecting the initiative portfolio, being used for transparency and fairness and also to focus management attention (Loch and Tapper, 2002; Simons, 1995). The authors report the use of 16 measures on the radar chart. It appears that the most important measure identified is the only feedforward measure; value creation potential. The study also notes characteristics of NPD that make performance measurement difficult; challenges of directly observing effort levels, similarly the difficulties in observing the consequence of actions and also the high levels of associated uncertainty.

These research findings present the important use of feedforward metrics in NPD in the management of new product performance, to help establish and review targets, to communicate priorities and support portfolio management decisions. The findings also highlight the challenges of performance measurement systems in NPD.

A recent longitudinal performance measurement systems study in NPD focuses only on feedback measures and does not report the use of feedforward measures, though actually notes in the findings the problem of too much emphasis on the use of feedback measurement in NPD, and therefore, by implication, the need for more feedforward measurement. The study used a questionnaire survey study of manufacturing companies in Europe, USA and Japan, carried out twice, with a five year gap in between, monitoring the evolution of performance measures used in NPD (Rogers et al., 2005). The study found a number of challenges and shortcomings in the use of NPD metrics. This included too much focus on the past using 'lagging' metrics, the time delay in long term projects making benefit recognition difficult to evaluate financially and the problems of adjusting the measures to reflect changes in the NPD strategy. The two measures that the survey respondents most desired to capture were both customer

oriented; firstly identification and interpretation of customer needs and secondly customer satisfaction. The study only focuses on feedback measures, with no investigation of the use of feedforward measures.

From an interest in improving innovation performance Kanter (2006) notes a different perspective in the requirement for appropriate metrics for the type of innovation. For example she observes that incremental innovation measures should be different to breakthrough innovation.

The following studies in the Italian technology sector investigate the use of measures in R&D and NPD and have identified benefits of performance measurement systems for knowledge generation, communication and project team visibility. The contextual nature of the research is also noted as an important dimension in the selection and use of performance measurement systems in R&NPD.

A longitudinal ten year study of an Italian jet trainer aircraft development examined the application and use of performance measurement systems in NPD projects and concluded that the benefits of performance measurement systems in NPD were the build-up of knowledge on project monitoring, development of management techniques, co-ordination and communication and providing greater visibility of the project team to top management (Chiesa et al., 2007a). The study tentatively claims that measurement frequency and standards related to process performance, are those most likely for regular adaption.

A multiple case study of four Italian firms operating in various technology intensive areas, using two in-depth interviews per firm, investigated the relationship between the objectives of the metrics used and the performance measurement systems design choices in each case study. The R&D function was the unit of analysis. The study finds the need for a ‘contextual’ approach to select appropriate measures. The context dimensions include the stage of the process (basic research, applied research or product development), performance measurement systems objectives, the uncertainty characteristics of the project and the product strategy being pursued (Chiesa et al., 2007b). In a paper investigating eight firms in the technology intensive sector (Chiesa and Frattini, 2007) the findings show that efficiency metrics are the main emphasis of

development performance measurement systems and ‘contribution to value’, a feedforward metric, for research performance measurement systems. These studies support the previous findings on the changing nature of measures along the R&NPD process.

More recent studies have focused on identifying key NPD measures, the role of strategic performance measures and understanding the measurement dimensions to evaluate innovation success. It is argued that sustainability of a NPD process is dependent on the supporting performance measurement systems (Francis, 2009) and a study of 57 medium-sized Spanish firms identified three key NPD measures; introduction rate of new products, the percentage of the product portfolio related to more recent product introductions and measures on the pioneering tendencies of the firm (Bisbe and Malagueno, 2009).

‘Interactive’ (Simons 1994,1995) use of strategic performance measurement systems is found to help develop entrepreneurship and marketing orientation capabilities (Micheli and Manzoni, 2010). A questionnaire survey of 104 Taiwanese firms investigating the use of performance measurement systems to improve NPD performance in SMEs finds that the measurement dimensions to evaluate success are financial performance and customer and market ‘acceptance’. However, the involvement of multiple stakeholders and the varying levels of analysis make the understanding of NPD success still difficult to clarify (Fu, 2010).

The findings show that the use of feedforward measures is important in the performance management of NPD. The use of value creation assessment and strategic performance metrics helps manage uncertainty in the early stages of NPD and the measures used should be both financial and non-financial. The nature of NPD makes performance measurement challenging and problematic, caused by the high levels of uncertainty and establishing the consequences of actions. It has also been found that the use of performance measurement systems in NPD has placed too much emphasis on feedback measures and not enough on feedforward control metrics. The extant literature suggests that performance measurement in NPD guides decision-making through the process, though the selection of measures is dependent on which stage of the process is being managed, either research or development. From a management

control perspective, when considering the NPD process, the use of both feedforward and feedback measures are an input into management evaluation, especially at the stage-gates. However, the findings suggest that the selection and use of performance measurement systems in NPD processes act as a moderator on these inputs (Figure 12).

The next results discussed are on the use of management controls at the NPD stage-gates.

4.3.5 STAGE-GATE EVALUATION

The studies of stage-gates, NPD and management controls clearly highlights that the stage-gates are the critical feature in the NPD process landscape. There are two early studies that recognized the need for a more structured approach to NPD (Holt, 1970; Ramsey, 1981) but post an influential study on stages and stage-gates (Cooper, 1990) the gates have become a focus of NPD research, identified as the critical points in the NPD process. From a feedforward control perspective the relevant studies have examined the stage-gates for use of screening criteria for product “kill” decisions, portfolio prioritization assessment, the value proposition and fit with firm strategy. The literature provides guidance that for empirical research of management controls and NPD, studies should focus on what happens at the stage-gates.

Early studies note the requirement for a more structured and mechanistic approach to the NPD process. To have control over the NPD process, as the number of new product projects becomes large, it is argued that a more mechanistic approach is required (Holt, 1970). A framework to organize the selection of new product projects, acknowledging the partial use of subjective assessment, proposes that selection is assumed to use multiple indicators, such as growth, economic targets and stability performance targets. Stability targets being, for example, the likely life cycle time in market for the new product (Ramsey, 1981).

Subsequent studies have used the key work of Cooper (1990) on the stages and stage-gate mechanism as a research basis. The control studies have focused on the “kill” decisions and the importance of screening criteria. A major study that conducted interviews with senior managers in 125 firms in the mid-1980s to gain an understanding

of the evaluation of NPD “kill” decisions in the stage-gate process and to understand the decision ‘rules’ that are applied found that management has considerable problems in assessing or predicting these decision success variables. That is for management to operationalize the key criteria of product uniqueness, superiority and quality relative to the competition is difficult (Cooper and Kleinschmidt, 1990). The study also claims that the main “kill” reasons, in descending order are; there is no product advantage, the market is too small, the product is not needed, the price is uncompetitive, there are technical problems or priorities have changed.

A study assessing the practicalities of how to better implement changes to the NPD process argues the importance of the application of NPD ‘funnel’ screening criteria, the review of alternatives in the sequence of critical decisions and evaluating the compliance of product performance to a set of varied dimension goals. It is also suggested that all functions should be involved in these critical product planning decisions (Karlsson and Åhlström, 1997). The use of evaluation criteria in NPD is a means to ‘focus managerial attention’ (Martinsuo and Poskela, 2011). This management focus at the stage-gates can promote strategic alignment (Akroyd and Maguire, 2011).

The bulk of stage-gate studies have examined the use of screening criteria and the process inadequacies of applying, or not applying, the “kill” mechanism. The overriding conclusion from all these studies is that the stage-gate is a critical point in the NPD process, where the applications of management controls have a significant effect on the performance of NPD. Although stage-gates are a leading facet of the NPD process they are under-researched (Schmidt and Calantone, 2002), especially in comparison to the actual ‘stages’, and more importantly that researching these gates is more likely to provide greater opportunity for improving NPD process effectiveness. The best practice firms are found to focus on the stage-gates and improving the product selection process, ensuring clear and transparent gate selection criteria so that the ‘go’, ‘kill’ and prioritization decisions can be made objectively (Cooper et al., 2002). The advice for NPD managers is that the stage-gate meetings should be ‘tough’ and be seen as the ‘quality control checkpoints’ in the NPD process.

A general lack of focus has also been reported in NPD project management studies, evidenced by an unwillingness to kill projects and not having clear kill mechanisms at the stage-gates. The key improvement proposal being that less projects should be done but done better (Cooper and Edgett, 2003). To do this requires management to have the 'will to kill', with tough and rigorous stage-gates, periodic project ranking and portfolio reviews and robust and transparent go/no-go/kill evaluation criteria. These ideas have been reinforced by Godener and Soderquist (2004) who emphasize the importance of a 'continuous inter-functional stage-gate approach' to the evaluation of projects and performance.

A best practice summary promotes the necessity for clearly defined, highly visible, well-documented, "Go" or "Kill" stage-gates and that the criteria should be both specific and have a strategic emphasis (Kahn et al., 2006). Examples presented of such criteria are core capabilities fit, market demand and financial goals. It is also argued that industry competitiveness is dependent on the use of stage-gates in the NPD process, though too much control formality can risk promotion of lower-risk, swift reward projects and possibly harm NPD productivity (Harmancioglu et al., 2007).

The important role of the stage-gate mechanism is further strengthened with findings that the management control of the NPD process is distinctly shaped by the stage-gate mechanism and that cost and progress transparency is, to the greater part, established at the stage-gates. Transparency is defined as 'the extent to which users understand the up- and downstream implications' (Jørgensen and Messner, 2009). This transparency at the stage-gates is claimed to be achieved by formal control components; financial assessment and evaluation tools and performance against budget.

A study of formal structured approaches to managing NPD concludes that structured approaches are cases of 'administrative management technologies' and are liable to 'sensemaking' by managers, at one extent being mandatory and at the other being considered a checklist. Therefore, with stage-gate evaluation, the organizational context needs consideration, described by labels such as application, rigidity, interactive use, frequency of use, adaption into culture and adoption into the firm (Christiansen and Varnes, 2009).

An investigation into the improvement of NPD practice in FMCG brands and to better understand the changing characteristics of the information inputs into the decisions made at the various evaluation stage-gates found that along the NPD process the evaluation 'net' became increasingly finer, with 'tighter' criteria, to weed out potential product failures. At each stage-gate it was found that the criteria consistently applied by management was the management need to be convinced of the product value proposition and the firm fit, that is the portfolio value and strategic alignment. Five study evaluation points were noted; initial screen, detailed screen, pre-development evaluation, pre-commercialization review and post-commercialization review. The authors also note the sparseness of new consumer product development research studies (Saunders et al., 2005).

In conclusion of the extant literature on stage-gates and also considering the Review Questions, when assessing the role of FAC and how the control enables NPD, the use of the control at the stage-gates is the crucial study location in the NPD process. The guidance from the extant literature is that empirical studies focusing on NPD and management control should concentrate on the stage-gates. Therefore, for synthesis of the SR findings, the use of FAC should be depicted or displayed at the stage-gate evaluation point where the go/no-go product selections are made (Figure 12).

The use of feedforward control in NPD and at the stage-gates has been noted in extant literature but it is not understood how this control influences NPD management teams to improve portfolio value and strategic alignment. The next systematic literature review result discusses NPD portfolio management.

4.3.6 PORTFOLIO MANAGEMENT

Portfolio management is identified in extant literature as an important methodology to establish an optimal set of NPD projects, to underpin strategic alignment of development initiatives, minimize the occurrence of too many low value projects and create an overall balanced and diverse set of new product developments.

For firms operating in a dynamic environment it is argued that they should have a portfolio of NPD projects that cover different levels of innovativeness and that market

and technological ‘fit’, directly associated with performance, should be the innovativeness dimensions for evaluation (Danneels and Kleinschmidt, 2001). Portfolio management is a method to improve overall product profitability through having more effective resource allocation, establishing an optimal set of projects and eliminating poor development projects at the stage-gates. Leading NPD firms have integrated portfolio management into the NPD process, creating a set of strategically aligned, balanced and rightly numbered set of new product projects (Cooper et al., 2002). Evaluating, ranking and prioritizing NPD projects in portfolio management is important to the performance management of NPD (Cooper and Edgett, 2003).

Within portfolio management, research suggests the use of strategic ‘buckets’ and project prioritization by applying multiple criteria or ranking within these buckets. The general problem is that too many low value under-performing projects are present in NPD portfolios and the need is argued to have effective go/no-go gates within portfolio management (Cooper and Edgett, 2003). Portfolio management is required to manage the stream of multiple product projects across functions and the firm value chain. This prompts development decisions that consider product viability, maturity and the use of ‘readiness’ criteria (Holmes and Campbell, 2004). Similar findings identify that the construction of portfolios is based on multiple criteria and that portfolio ‘mapping’ acts as strategic ‘communication’, optimizing resource allocation and supporting product decisions (Godener and Soderquist, 2004).

The formal portfolio management process is used to screen out concepts and the superior firms identify a balance between ‘breakthrough’ and ‘incremental’ projects (Kahn et al., 2006). Kahn et al. argue a further step in that the better performing companies balance both the number of projects and resources required in a formal and systematic process of portfolio management. The balance of multiple concerns in portfolio management is also identified by McNally et al. (2009). A diverse and balanced portfolio separates the most successful innovative manufacturers from less successful firms, confirming the importance of effective portfolio management capabilities (Francis, 2009). The new product decisions are formed out of the portfolio management process, by the alignment of many facets and the assessed importance of several factors that are discussed and reviewed in portfolio management meetings (Christiansen and Varnes, 2008).

There is a lack of practical guidance and understanding in how to assist effective NPD portfolio management. The activity and the “how” of NPD portfolio management is recognised as complex but crucial to a firm’s ‘long-term existence’. Firms are advised to use evidence-based decision-making and applying a ‘portfolio mindset’, with market ‘immersion’, cross-functional collaboration and critical thinking (Kester et al., 2011).

Extant literature presents portfolio management of NPD as an important and valuable approach to establishing more balance, diversity and profitability in the development of new products. Part of the management review and decisions made during the stages of the NPD process include changes to the portfolio, with removal or addition of developments or changes to prioritization. From a management controls perspective portfolio management operates as an input construct into evaluation and therefore, considering synthesis of the results and the role of portfolio management, the findings suggest that portfolio management is part of the information input into the evaluation stage (Figure 12).

If FAC has a valuable role in NPD it will influence NPD management teams to improve portfolio value, influencing the size and composition of the NPD portfolio.

Next, the results on top management control and NPD are presented.

4.3.7 TOP MANAGEMENT CONTROL

Studies of top management control and intervention show that it can enable or constrain innovation. The detrimental impact can be caused by top management forcing too much control on an organization, taking a more directive role, having high levels of intervention and adopting too much close monitoring. The beneficial impact is in using a combination of management controls to focus attention, to communicate agendas and foster learning on uncertainties. Beneficial top management control is also found in the championing of ideas, communicating an aspirational vision of the future, selecting middle management personnel, establishing an effective reward culture and providing appropriate feedback to the NPD teams.

In considering the use of corporate planning, from a control systems theoretical perspective, a theoretical paper discusses how top management can stimulate innovation and creativity through the use of corporate planning, applying ‘organized entrepreneurship’ and ‘institutionalized innovation’ (Taylor, 1976).

Simons (1994,1995) describes how his Levers of Control framework can be used by top managers for strategic renewal, turnaround or evolution. He proposes that combinations of the use of these controls by top management focuses attention across the organization, communicates agendas, demands accountability and creates discomfort with current performance. From an innovation perspective, which Simons notes drove the origins of his work in this area (Simons, 1995), when he was trying to understand how top management achieved both creativity and control, argues that the Levers of Control ensure ongoing management attention to new strategic developments and initiatives and foster learning on uncertainties in the face of the firm’s strategic vision.

A study, using questionnaire survey, investigating how top managers use formal and interactive control systems for controlling NPD (Bonner et al., 2002) found that the type of top management intervention and participation was a factor on performance, especially when formal controls are forced onto the organization or too much control is exerted. The typical detrimental top management behaviour described in the study includes developing a more directive role, rather than a facilitative or integrative role, or a lack of involvement in the early stages of setting operational controls. The authors also note the scarcity of research on the influence of formal controls on NPD performance.

High levels of top management intervention and too much close monitoring constrains creativity and hampers the development of breakthrough innovation. However, when environmental uncertainty is high, greater top management involvement is required (Harmancioglu et al., 2007). A qualitative study of three US based SBUs of a major manufacturing building materials conglomerate (Durmuşoğlu et al., 2008) identified the key processes by which top management influence NPD. These processes include championing ideas and the influencing of outcomes, achieved through functional expertise, external environment awareness, power to progress ideas, communicating

aspirational future vision, selection of middle management and the innovation reward culture. It is also argued that a key top management strategic innovation consideration is whether to lead in the market or to follow. This has a significant impact on the level of innovation 'aggressiveness' pursued, between incremental and breakthrough NPD (Durmuşoğlu et al., 2008).

The ability of top management to influence NPD and control strategic renewal is greatest at the front-end of the process, using a more knowledgeable and balanced perspective than other employees and focusing on the roles and responsibilities for tasks and the allocation of resources (Poskela and Martinsuo, 2009). The feedback given by top management to NPD project managers, through 'sensemaking' processes, has a significant effect on NPD performance (Christiansen and Varnes, 2009).

Top management control and intervention can have a detrimental or beneficial impact on NPD performance. The approach taken by top management can enable or constrain NPD. The adverse effect is observed when top management is too directive, has high levels of intervention and close monitoring. The favourable effect is observed with presenting aspirational future vision, supporting ideas and effectively using a combination of management controls. Therefore, when considering the role of FAC in the NPD process, it can be concluded that top management control can have a moderating effect on the application of feedforward control (Figure 12).

Product innovativeness and management controls are discussed next.

4.3.8 PRODUCT INNOVATIVENESS

Research on the relationship between product innovativeness and management control has shown that radical or breakthrough innovation requires significantly different business practices and screening criteria compared to those for incremental innovation (Rice et al. 1998; Chiesa et al. and Noci, 2009). These ideas have also been recognised in attempts to describe the dimensions of product innovativeness, using market and technology 'fit' perspectives (Danneels and Kleinschmidt, 2001) or 'relative newness' and the level of innovation (Francis, 2009). Breakthrough products can represent a substantial threat to the firm since design, marketing and construction methods are less well understood or known (Schmidt and Calantone, 1998).

Therefore extant research suggests that, dependent on the screening criteria and the dimensions used for particular levels of innovativeness by NPD managers, product innovativeness can have a moderating effect on the use of feedforward controls (Figure 12).

The next systematic literature review result coding discussed is “escalation of commitment”.

4.3.9 ESCALATION OF COMMITMENT

Research has shown that the more innovative the product the greater the new product project managers reluctance to discard or kill a failing project (Schmidt and Calantone, 1998, 2002; Cooper and Edgett, 2003). This has been described as ‘escalation of commitment’ defined as the excessive investment in a course of action, where decisions are made that go beyond that which the circumstances warrant. It is argued that the propensity for such behaviour is very high during NPD (Schmidt and Calantone, 1998, 2002) with the most closely related behavioural mechanism being self-justification (Schmidt and Calantone, 2002) and also where managers are inclined to bias the evaluated information according to their preferences and beliefs.

Therefore this behaviour, also related to product innovativeness, can act as a moderator in the application of feedforward control (Figure 12).

The next sub-section summarises the remaining systematic literature review results codings.

4.3.10 OTHER CODING

The findings from the coding work present a number of constructs which appear to have a moderating role; cost information effects, cognitive analytical capability, participative goal setting, core capabilities and rigidities, aspiration levels, strategic typology, risk behaviour, domain relevant knowledge and reward systems. Most of these moderators appear to affect the use of feedforward controls. One of these moderators appears to affect the inputs (Figure 12), cost information effects, and another moderator appears to affect evaluation (Figure 12), which is cognitive analytical capability.

Two investigations have identified the positive effect on NPD performance of cost and design information and the impact on new product cost effectiveness with the availability of specific cost information (Davila, 2000; Booker et al., 2007). Therefore cost information effects have a moderating impact on the input information within the NPD process.

Research has also shown that there is a strong correlation between cognitive analytical capability and superior NPD performance. NPD involves the complex balancing of multiple elements for evaluation, requiring an ability to analyse problems and the impact of each element (McNally et al., 2009). Therefore cognitive analytical capability will have a moderating effect on the evaluation activity.

It has been argued that the creative potential of cross-functional teams working on NPD can be maximized by allowing the teams to define the project controls and processes and that team participation in determining the front-end targets is a strategic consideration for NPD (Bonner et al., 2002; Poskela and Martinsuo, 2009).

The following two described studies have found that certain core capabilities can enhance NPD, especially around systems, skills and values. Core capabilities are defined as the ability of a company to strategically differentiate itself in the marketplace (Leonard-Barton, 1992). However, when NPD managers keep to these methods of behaviour, and avoid challenging the existing approaches to development, these methods can become a dysfunctional hindrance and a core rigidity. It has also been observed that firms with a good innovation propensity tend to become even more innovative, unlike firms with a limited innovation propensity which tend to become even less capable (Bisbe and Otley, 2004).

It has been found that innovation changes can be influenced by the aspiration levels of managers, affecting the levels of risk taken, with managers being guided by how the firm is performing relative to its targets and goals (Greve, 1998). It is suggested that the greater the upward movement required to achieve the firm’s goals and aspiration, the higher the amount of risk-taking.

It has been argued that firm strategic typology can constrain innovation and affect control because it can limit management's ability to identify opportunities. Four types of strategic innovation are defined in the typology; defender, prospector, analyser and reactor (Durmuşoğlu et al., 2008, Miles et al., 1978).

Research has also noted that NPD performance can be affected by risk behaviour which in turn is associated with managerial controls systems and how the problem domain is framed (Poskela and Martinsuo, 2009; Sitkin and Pablo, 1992).

Recent study has argued that knowledge is a key factor in creativity and innovation, with greater knowledge having a beneficial effect on creativity (Wynder, 2007). It is proposed that controls should be lower when NPD managers have high domain relevant knowledge since this will enhance the creative output.

Research has also proposed that to have effective incremental innovation requires company reward systems to be linked to performance against management control targets (Simons, 1994). These targets should be set at demanding levels with bonuses clearly linked to the critical performance metrics.

These findings suggest that moderators affecting the application of feedforward control include participative goal setting, core capabilities and rigidities, aspiration levels, strategic typology, risk behaviour, domain relevant knowledge and reward systems (Figure 12). Cost information effects moderate the input information and cognitive analytical capability moderates the evaluation activity in the NPD process (Figure 12). These moderators will need to be considered in the research design of the empirical projects of my study.

There are results from the review that guide empirical study of management controls in NPD. These results are presented next.

4.3.11 EMPIRICAL RESEARCH DESIGN

This section discusses NPD studies found in the review that provide guidance for empirical research design on the use of FAC in NPD. The common emphasis of the empirical research guidance provided in these studies, for understanding the role of

management controls in the performance management of NPD, is to use longitudinal qualitative studies that capture product performance outcomes and focus on the stage-gates.

A key concern in the following systematic literature review selected studies is the distortions caused by retrospective information and post hoc rationalization. The concerns also note how it is much more difficult to ascertain the controls impact when the actual performance of the product in the market is not understood or captured. It is argued that to overcome these limitations requires longitudinal study, with measurement through the process, along the development cycle, and with assessment of outcomes, when the product has been sold in the market for some time (Danneels and Kleinschmidt, 2001; Schmidt and Calantone, 2002; Bonner et al., 2002; Saunders et al., 2005; Christiansen and Varnes, 2008; Revellino and Mouritsen, 2009, Chiesa et al. and Noci, 2009; Richtnér and Åhlström, 2010). It is also argued that qualitative studies are required to understand the dynamics and interplay between management controls and NPD because survey-based research will not be able to distinguish effects between different management controls being used (Marginson, 2002). It is also seen as more useful to observe the links between constructs than the constructs themselves (Revellino and Mouritsen, 2009).

The use of multiple informants, in these control and NPD studies, to enable triangulation of the data, is also considered important (Davila, 2000; Bonner et al., 2002). The lack of cross-disciplinary studies has also been identified as a limitation in extant empirical studies (Micheli and Manzoni, 2010). Also, a recent study has placed the researcher as observer in portfolio stage-gate meetings and with subsequent follow-up interviews with the meeting participants (Christiansen and Varnes, 2008).

When analysing the types of research methodologies used in feedforward control and NPD related studies (Appendix I) there are six longitudinal qualitative case studies (Islei et al., 1990; Simons, 1994; Karlsson and Ahlstrom, 1997; Nixon, 1998; Marginson, 2002; Jørgensen and Messner, 2009). Only two of these studies follow the development cycle (Karlsson and Åhlström, 1997; Jørgensen and Messner, 2009) and neither of these studies captures the performance outcomes.

No empirical study was found in the systematic literature review that fully matches the methodology recommended in the literature, to more effectively understand how the use of management controls influences NPD management teams. Karlsson and Åhlström (1997) were investigating how to manage the process of changing the product development strategy. Jorgensen and Messner (2009) were researching the use of different control mechanisms to balance efficiency and the need for flexibility in NPD. They noted the use of feedback and feedforward control at the stage-gates but made no observations on how feedforward controls are used in the NPD process.

The review of these studies guides the desired methodology and design for management controls investigations in NPD and for empirical study of a research project on how the use of FAC influences NPD management teams to improve performance. The guidance proposes:

- longitudinal study that follows the NPD process (Danneels and Kleinschmidt, 2001; Schmidt and Calantone, 2002; Bonner et al., 2002; Saunders et al., 2005; Revellino and Mouritsen, 2009; Richtnér and Åhlström, 2010)
- qualitative study (Marginson, 2002; Christiansen and Varnes, 2008; Chiesa et al. and Noci, 2009)
- observing the stage-gate meetings, with follow-up interviews (Schmidt and Calantone, 2002; Saunders et al., 2005; Christiansen and Varnes, 2008; Richtnér and Åhlström, 2010)
- capturing product performance outcomes (Saunders et al., 2005; Chiesa et al. and Noci, 2009; Richtnér and Åhlström, 2010)
- observing the links between constructs (Revellino and Mouritsen, 2009)
- data triangulation (Davila, 2000; Bonner et al., 2002; Revellino and Mouritsen, 2009).

A notable finding of the review is that in extant literature no NPD empirical research study was found on management controls and NPD that has met these methodological requirements.

Next the findings of the systematic literature review are discussed and an overall research question is identified.

5 FINDINGS AND DISCUSSION

In this section I first present a summary of the findings of the systematic literature review in the study area of management controls in NPD. Secondly, the findings and development of the concept of FAC are discussed. Thirdly, the findings on the "mechanism" of boundary controls are noted. Next, the theoretical positioning of the use of FAC is considered and from this the research question is developed. Finally, the implications, captured in the results, for the planned empirical projects of my research study are discussed.

First, it is useful to summarise the key areas of research in extant literature where the domains of management controls and NPD cross-over.

5.1 Extant Literature – Key Areas of Study

The results of the review and the references listed in each reviewed paper show the amount of literature that has been written on management controls in NPD. Where the literature domains of management controls and NPD cross-over, published peer-reviewed research over the past twenty years has studied various areas. These key areas of study have been (Appendix G):

- the stages and stage-gate process
- managerial behaviours, controls and performance measures
- management controls that enable and constrain NPD, including the idea of "balancing" creativity and control
- new product research and development (R&D) portfolio management
- escalation of commitment
- continuous ("incremental") and discontinuous ("breakthrough") innovation.

Given the recognised importance of NPD to firm performance, the general underlying theme of all this research is a desire to understand how to improve the performance and outcomes of the NPD process.

Next, the development of FAC from the results is discussed and a graphical synthesis of the results of the systematic literature review is presented.

5.2 Feedforward Anticipatory Control

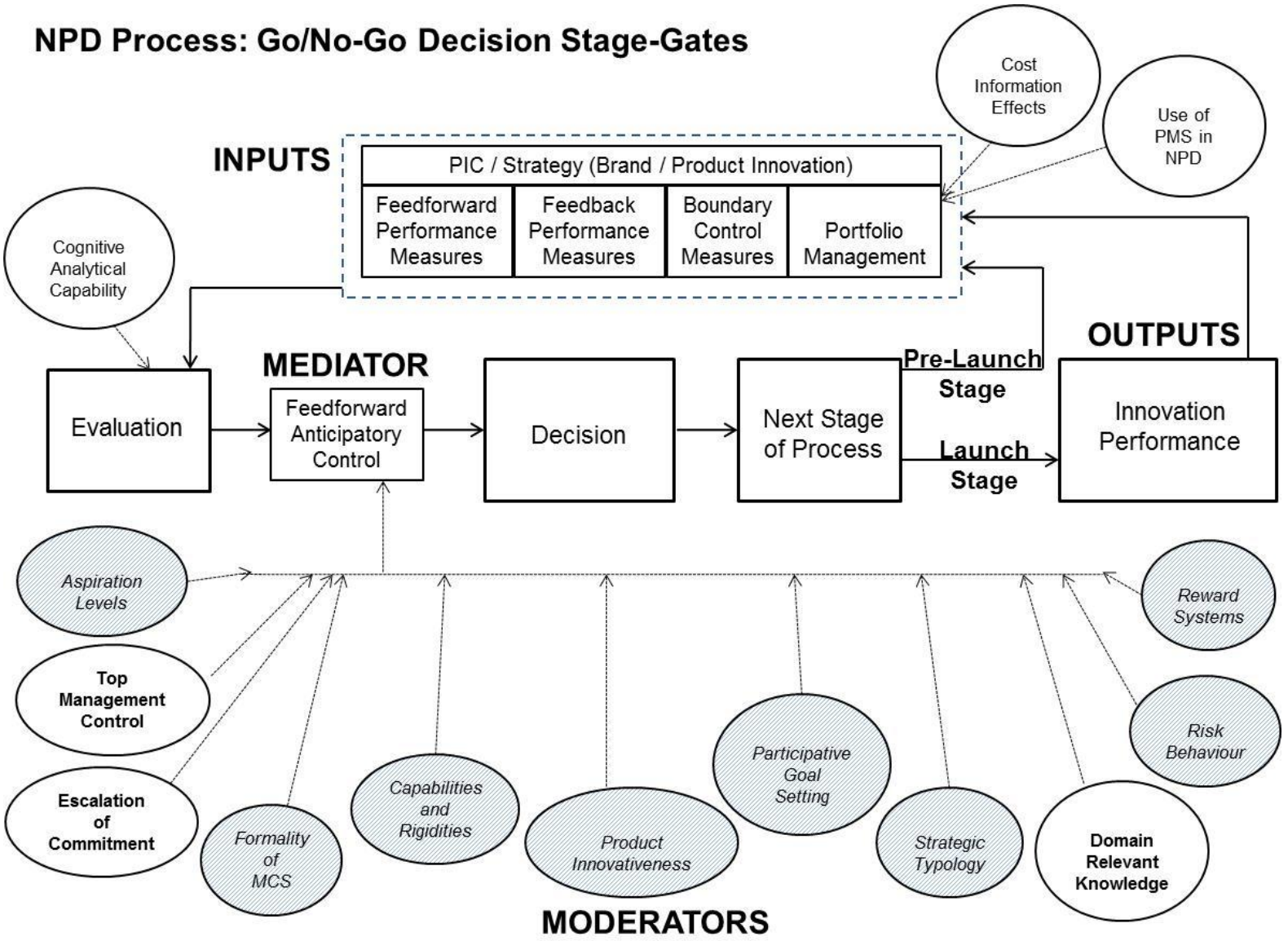
An initial finding of the review was that the terminology used in the review question of "forecast value outcomes" should be designated as "feedforward controls", as guided by the papers on systems, control theory and feedforward control (Koontz and Bradspies, 1972; Ishikawa and Smith, 1972).

From the results, by combining the feedforward concepts of anticipated and expected outcomes within anticipatory control, with the feedforward control aspects of forecasting, strategic value planning, and management controls and goal setting, and also with double-loop learning, a new concept has been developed that more broadly captures the use of feedforward controls in this NPD context. This concept has been called "feedforward anticipatory control", used to designate the feedforward management controls used in the NPD stage-gate meetings. FAC has been operationalized or identified theoretically as anticipatory control, strategic value planning, scenario planning, forecasting, management controls and goal setting, evaluation and screening criteria, and feedforward controls and metrics.

It is logical that in the NPD process stage-gates, the product selection decision made by the NPD management team, into the next stage of the process, is taken after the activity of evaluation (Figure 12).The product selection decision is not taken before evaluation is completed. However, given that FAC is anticipating the effect of the decision and whether the decision will realize objectives and targets, this control is being applied after evaluation and before the decision.

When the NPD management team has made the stage-gate evaluation and are at the point of decision, FAC is the key control in operation determining whether the product should be allowed to go through to the next stage, be "killed", or altered. Therefore, FAC sits in between evaluation and decision, in a mediating role. This is how it has been presented in the model depicting synthesis of the results (Figure 12). This also shows that FAC is a crucial control in the process because it is operating at the final point of product selection decision.

Figure 12 Synthesis of the results – presented as a graphical model



From the review I have identified a number of moderators that can influence the application of FAC and can therefore enable or constrain NPD when feedforward control is being used. These moderators are; aspiration levels, top management control, escalation of commitment, formality of management controls, capabilities and rigidities, product innovativeness, participative goal setting, strategic typology, domain relevant knowledge, risk behaviour and reward systems. These moderators are shown in the graphical synthesis of the literature review results (Figure 12). I will need to consider these moderators in planning my proposed empirical research. Some of these moderators could be controlled for in empirical research by the careful choice of research design.

Other moderators have been identified which can affect the input information going into evaluation; cost information effects and use of performance measurement systems in NPD. The evaluation activity is also moderated, by cognitive analytical capability (Figure 12).

The findings on boundary controls, the second control “mechanism” included in the Review Questions, are discussed next.

5.3 Boundary Controls

The literature on boundary controls is more limited given the straightforward nature of the control, however there has been interest in how the control works in combination with other controls to enable and constrain NPD (Simons 1994, 1995; Chiesa et al. 2007b; Micheli and Manzoni, 2010; Artto et al., 2011).

The research interest has been twofold, firstly whether or not boundary controls are being applied and secondly how they work in combination with other management controls. The combination of diagnostic and boundary controls have been found crucial for ‘hard’ targets and the combination of boundary controls and belief systems for balancing creativity and control. From a management controls perspective, in synthesis of these results, the literature suggests that boundary controls are a component of the input into evaluation at the stage-gates, as presented in Figure 12.

I did not find a specific study or any scholarly claims of how feedforward controls work in combination with boundary controls in the management of NPD.

5.4 Theoretical Positioning of the Use of FAC

The findings of the literature review describe the role of management controls in NPD and also identify that the use of FAC can have a valuable role in influencing NPD management teams to improve portfolio value and strategic alignment. However, how FAC influences NPD management teams to improve portfolio performance and strategic alignment is still not understood now. Improving NPD portfolio value and achieving strategic alignment (Cooper et al., 2002) seems particularly relevant to the business problem at the centre of my overall research study.

To improve performance, management use controls for constantly evaluating goals and activities (Burton et al., 1988), for strategic renewal (Simons, 1994), for obtaining information needed to reduce uncertainty (Nixon, 1998) and to control the strategy process (Marginson, 2002; Miller and Friesen, 1982). Management controls are used to identify the value contribution (Jørgensen and Messner, 2009), select profit maximising initiatives (Bisbe and Otley, 2004; Simons, 1994) and evaluate trade-offs among projects (Bisbe and Malagueno, 2009; Miller and Friesen, 1982).

FAC has a specific role in minimising the difference between planned and actual performance and to improve performance of strategy and project selection. The control anticipates the need for preventative action that is taken before the difference between planned and actual performance occurs (Ishikawa and Smith, 1972). A notable feature of the control is the timing of the control function and its association with planning. The control is an anticipatory control (Ishikawa and Smith, 1972) that involves future directed controls (Koontz and Bradspies, 1972), focusing on strategic uncertainties (Bisbe and Malagueno, 2009) and can be used in project selection assessment (Jørgensen and Messner, 2009). Therefore the use of FAC can help improve performance. Therefore FAC has an important role in managing NPD performance.

Management control system design and use is positively related to NPD performance (Davila, 2000). However, there is a concern that excessive management controls, or management controls that are too formal or rigid can constrain or stifle new product development (Radosevich, 1977; Cowen and Middaugh, 1988; Davila, 2000; Frow et al., 2005; Morris et al., 2006). On the other hand, management controls can curb profligacy and reduce excessive and wasteful new product development (Miller and Friesen, 1982; Simons, 1994; Langfield-Smith, 1997; Bisbe and Otley, 2004). Therefore, to improve performance, management controls simultaneously needs to curb wasteful product development but not stifle it. Management controls should reduce risk, assist with strategy and goal alignment, decrease uncertainty and at the same time encourage risk tolerance and experimentation (Peters and Waterman, 1982; Simons, 1994, 1995; Davila, 2000; Bisbe and Otley, 2004; Morris et al., 2006; Richtnér and Åhlström, 2010). If FAC has a valuable role in influencing NPD management teams it will curb excessive and wasteful product development but not stifle it, assist in achieving strategic alignment, and improve performance, measured by the value delivered from the product portfolio.

Despite it being over forty years since Koontz and Bradspies (1972) recognised the importance of using feedforward control in NPD, I have not found a specific theoretical or empirical study undertaken that understands how these controls are used to influence NPD management teams to improve NPD performance. Even now reading the literature does not tell us how feedforward control influences NPD management teams to improve portfolio value and strategic alignment.

From this analysis I have concluded a valuable research question for empirical study: “How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?” Answers to this question can provide contribution to knowledge of management controls and also contribution to practice, in the management of product range building.

The final part of this section summarizes the findings on literature guidance for empirical studies of management controls in NPD.

5.5 Guidance on Research Design Methodology for Project 2 Empirical Research

The findings from the systematic literature review provide guidance on the desired methodological requirements for empirical study of a research project on how FAC is used in the performance management of NPD. To effectively understand the role of such controls in the performance management of NPD requires the use of longitudinal study that follows the NPD process, using qualitative methodology, observing the stage-gate meetings, capturing performance outcomes, observing the links between constructs and ensuring data triangulation.

The systematic literature review concludes that although there are studies recommending this empirical research design, I have not found published research that has used this methodology. My empirical studies will need to address these shortcomings presented by extant research to be able to answer the identified research question.

6 SUMMARY AND CONCLUSIONS

Systematic review has been an effective way of identifying the extant literature on feedforward and boundary controls, extracting data and determining what is known about how these controls enable and constrain NPD.

The results show that the use of FAC has a significant and important role in the management of NPD. The control helps manage uncertainty in NPD, helps balance creativity and control, uses feedforward screening criteria and metrics, applies anticipatory scenario planning, influences innovation, constrains excessive NPD and assesses lucrative market potential. The findings also show that FAC is a crucial control in the process because it is operating at the point of product selection.

Captured within the results is the reported notable scarcity of research in the use of management controls in NPD (Davila, 2000; Bonner et al., 2002; Saunders et al., 2005). Despite the recognized importance of feedforward control, no specific theoretical or empirical study has been found on the use of the control in NPD.

Moreover, no study has been found that presents an understanding of how the use of FAC influences NPD management teams.

A valuable research question for empirical study has been identified from the findings: “How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?” Answers to this question can provide contribution to knowledge of management controls and also contribution to practice, in the performance management of NPD portfolios.

The extant literature provides guidance for empirical studies on NPD and management controls that I need to consider for my empirical projects. The research design should use longitudinal study that follows the NPD process, using case study qualitative methodology, observing the stage-gate meetings, capturing performance outcomes, observing the links between constructs and ensuring triangulation of data with multiple, cross-disciplinary informants. The literature research guidance on a stage-gate focus notes that they are the critical points in the process where research study concentration is more likely to provide greater insight and understanding into how to improve NPD performance.

My first empirical study is planned to develop a Framework, based on the systematic literature review findings. The proposed Framework is to be used in an interventionist empirical study (Project 3) to help understand how the use of FAC influences NPD management teams to improve portfolio value and strategic alignment.

PROJECT 2

An Empirical Study

ABSTRACT

My systematic literature review (Project 1) identifies a valuable research question: How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment? Providing answers to this question will bring contribution to knowledge of management controls in NPD and also guidance and implications for practice in the management of product range building.

My first empirical study (Project 2) develops two frameworks and establishes them through empirical study, for use in the action research longitudinal empirical study (Project 3) planned to measure changes in levels of FAC sophistication and changes in NPD portfolio value and strategic alignment. The two frameworks are 1) FAC Framework and 2) Portfolio Performance Framework.

In this study (Project 2) I research eight brands, multiple units of analysis in a single organization, the Brands Group. The study uses data and methodological triangulation and resultant frameworks are sense checked with knowledgeable informants. The findings show that different levels of FAC sophistication can be identified and applied by NPD management teams in stage and stage-gate NPD. I also find that higher levels of FAC sophistication appear contingent on consolidation of lower levels of FAC. A “FAC metric” ratio is identified that is a highly practical decision-making shaping productivity measure that guides NPD management teams in product selection challenges. It is also observed that higher levels of FAC sophistication appear to influence improvements in portfolio value and strategic alignment.

Two propositions are developed in this study, for testing in the final empirical action research study (Project 3):

1) *A change to higher levels of FAC sophistication influences NPD management teams to improve portfolio value.*
2) *A change to higher levels of FAC sophistication influences NPD management teams to improve strategic alignment.*

1 INTRODUCTION

The introduction discusses the background and rationale for the project, the specific purpose of the project and the structure of this paper.

1.1 Background and Rationale for the Project

The business problem driving this overall research study, is to find ways to better performance manage the product range build activity in the branded footwear and apparel industry. Finding solutions to improving performance management in range building, given the contextual and macroeconomic challenges, is considered vital to long-term value creation for brand firms in the industry. The global branded footwear and apparel market has an estimated value of $300 billion.

My systematic literature review results identify a valuable research question: How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?

Exploring answers to this question will bring contribution to knowledge of management controls in NPD portfolio management and also guidance and implications for practice in the management of the product range building activity in the branded footwear and apparel industry.

1.2 Specific Purpose of the Project

My final project (Project 3) is planned as a longitudinal field study that intervenes and changes the level of FAC sophistication in multiple examples of the unit of analysis and captures changes in portfolio performance (Figure 19 and Figure 21), through both “hard” metrics and “softer” measures of performance.

Therefore the specific purpose of this study (Project 2) is to establish, through applied empirical research, frameworks that can be used in the action research study to measure the changes in levels of FAC and the resultant changes in performance. The results of this project are the development of two frameworks. The first is an FAC Framework (Figure 29) that can assess the brand FAC sophistication levels, before and after intervention. The second is a Portfolio Performance Framework

(Figure 31) that can be used to measure changes in hard and soft measures of portfolio performance.

1.3 Structure of the Paper

The paper is structured in eleven sections.

The first section is this introduction which notes the background and rationale for the project and the specific purpose of Project 2.

In section two I review the theoretical positioning of the work, placed within management control theory.

Within section three I discuss the need for the frameworks and present how literature and logic have been used for deductive development of the “initial” FAC Framework. The argument for inductive empirical development of the second framework, the Portfolio Performance Framework is also discussed.

I discuss the methodology of the study in section four. This section examines the planned interventionist methodology and the research design, including guidance from the literature and implications of the research question. The unit of analysis and the selected cases are discussed. The field experimental method is considered, including the approach to empirical inductive development of the frameworks. Finally the case for validity and reliability is presented.

In section five I will present the results of the empirical study. There are two key parts, firstly the inductive development of the FAC Framework and secondly the inductive development of the Portfolio Performance Framework.

A cross-case comparison between the cases is presented in section six, along with a cross-case comparison of the stage-gate review meetings observed.

Section seven discusses the results of the relevance and reliability checks carried out in the project. This covers the relevance check from three “external” brands and the reliability driven sense-check of the final framework results, carried out with key informants.

I present the findings and discussion in section eight. The two resultant frameworks are discussed and comparisons made to extant literature, including on the key

systematic literature review finding of “control and creativity”. Implications for the planned action research study are also noted.

Section nine is a personal reflection on the project.

Section ten is the conclusions and section eleven the limitations of the study.

In the next section I discuss the theoretical positioning of the study.

2 THEORETICAL POSITIONING

The purpose of this overall research study is to provide contribution to knowledge of management controls and relevance to practice in NPD portfolio management. To clarify the positioning of any contribution to knowledge requires continuous reference and application of the theoretical base throughout the research project, from literature review to empirical study. The theoretical base was determined in the systematic literature review as management control systems. The theoretical foundation for the study, within management control systems, is in the use of feedforward control within a systems feedback loop (Koontz and Bradspies, 1972; Ishikawa and Smith, 1972). In this study, FAC and the development of the FAC Framework also uses double-loop learning (Argyris, 1976, 1977; Senge and Fulmer, 1993), where there is the challenge or questioning of goals and targets in the feedforward loop.

I conclude in the systematic literature review that the use of the management control concept of FAC is considered important to influencing NPD management teams in the performance of NPD and is operationalized as anticipatory control, strategic value planning, scenario planning, forecasting, management controls and goal setting, evaluation and screening criteria, and feedforward controls and metrics.

FAC has a specific role in minimising the difference between planned and actual performance and to improve product selection in NPD portfolios. The control anticipates the need for preventative action that is taken before the difference between planned and actual performance occurs (Ishikawa and Smith, 1972). If FAC has a valuable role in influencing NPD management teams it will curb excessive and wasteful product development but not stifle it, assist in achieving strategic alignment, and improve performance, measured by the value delivered from the product

portfolio (Peters and Waterman, 1982; Simons, 1994, 1995; Davila, 2000; Bisbe and Otley, 2004; Morris et al., 2006; Richtnér and Åhlström, 2010).

In the systematic literature review results I identify a valuable research question: How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment? Exploring answers to this question will bring contribution to knowledge of management controls in NPD portfolio management and also guidance and implications for practice in the performance management of the product range building activity in the branded footwear and apparel industry.

The FAC concepts identified in the systematic literature review (Project 1) are a list of how FAC has been operationalized in the NPD literature. However, this is an unstructured list of concepts. They are not yet in an arrangement that has utility for addressing the research question through empirical study. Therefore a construct or structure for the FAC concepts needs to be established to carry out the planned action research. In the next section I commence this work by initial deductive development of the required FAC framework and also consider the need for an additional separate inductively developed NPD portfolio performance framework.

3 USING THE LITERATURE AND THE NEED FOR FRAMEWORKS

The action research study is a project planned to measure changes in levels of FAC and resultant changes in NPD portfolio performance. I have not found structures with such measurement utility in the literature for these two variables, FAC and portfolio performance. Therefore, to address the research question, the study requires development of these two constructs or structures. My systematic literature review has provided a list of FAC operationalized conceptualizations. The study now needs to use this list to develop and establish an FAC structure to enable empirical investigation of the research question. This section begins that development by using the list of FAC concepts and applies deductive development to create an initial FAC framework that has measurement utility for the planned action research empirical study (Project 3).

A suitable structure needed to measure changes in portfolio performance also could not be found in the literature. This obstacle is also discussed within this section and the rationale is presented for the inductive empirical development of this framework

to provide performance measurement utility for the planned action research empirical study.

Firstly, the next sub-section explains how an initial FAC Framework can be deductively developed from the literature and presents the development of this structure. The case for inductive empirical development of the second framework, the Portfolio Performance Framework is subsequently presented.

3.1 FAC Framework: Initial Development From The Literature

The first part of the research question is asking how FAC is used in the stage-gate NPD review meetings. The various types of operationalization of FAC in NPD were captured in the systematic literature review. However the literature review results are not yet in a structured format or framework that can be used in an interventionist empirical study. They are still just a list of labels (Table 3).

It would be logical that understanding how FAC is used in the stage-gate NPD meeting relates directly to whether these various types of operationalized FAC are actually being used or not in the process. In other words, the study needs to understand the effects of using a particular FAC operationalization compared to not using it.

Table 3 Operationalization of FAC in the Literature

FAC Label	Type of feedforward anticipatory control
Anticipatory control	Anticipatory feedback, anticipating deviations; anticipatory control; expected profitability of outputs; expected outcomes; anticipating needs and trends
Strategic Value Planning	Future directed controls; future profitability modelling; futurity and strategy formulation; future orientation; long range plans and priority setting; a focus on the return of new value; strategic front-end integrated questions; assessing lucrative market potential; long-term strategic orientation; a solid business case; contribution to value; future value calculation analyses; strategic performance measures
Scenario Planning	Preventing deviations from plan; evaluating plan prior to performance; weighing alternative courses of action; answering what-if questions; mechanisms for evaluating trade-offs among NPD projects

FAC Label	Type of feedforward anticipatory control
Forecasting	Profit forecast information; extrapolating patterns in order to forecast; forecasting future values; importance of forecast data in control systems; preliminary demand analysis and forecasting
Management controls and goal setting	Constant evaluation of goals and activities; proactively seeking goals which may be changing; integration and simultaneous development of product and strategy development; using Levers of Control for strategy renewal; using management controls to obtain information needed to reduce uncertainty; Management controls used to control the strategy process; use of interactive control systems to select profit maximising initiatives; specific and challenging goal setting at the explorative front-end of innovation; interactive management and accounting control systems have a focus on strategic uncertainties
Evaluation and screening criteria	The nature of decision-making in the NPD “funnel”; innovation screening criteria; stage-gate “should meet” criteria; portfolio management solutions that evaluate, rank, prioritize and focus on fewer but better NPD projects; tough rigorous gates with robust and visible go/kill criteria); readiness stage-gate criteria, “proceed with confidence to the next stage”; use of interactive control systems to “filter” excessive innovation; NPD evaluation criteria; highly visible formal stage-gate strategic emphasis go/kill criteria; stage-gate criteria and the use of feedback control and feedforward control
Feedforward controls and metrics	NPD reliance on feedforward controls; feedforward metrics set up before NPD project launch; the formalization of the R&NPD process with integration of feedforward performance measures; balancing financial and non-financial indicators, or lagging and leading indicators, can generate both feedback and feedforward loops

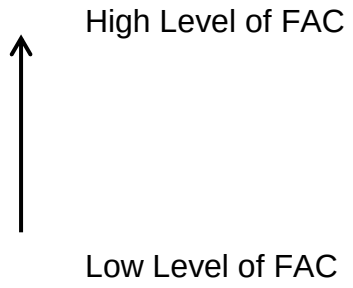
Additionally, it would be logical that the use of a particular FAC operationalization, compared to not using it, is an example of greater maturity or sophistication of FAC use. This idea is helpful for building a framework for interventionist empirical study because different maturity levels of FAC operationalization can be identified and used for categorization of the unit of analysis. There are many of these types of maturity stage models in the literature, some examples are shown in Table 4.

Table 4 Examples of Maturity Models in the Literature and the Stages or Levels of Maturity in those Models

Model Name	Maturity Stages	Paper
Six stages of data processing growth	Stage 1 Initiation Stage 2 Contagion Stage 3 Control Stage 4 Integration Stage 5 Data Administration Stage 6 Maturity	Nolan, 1979
Capability Maturity Model	Level 1 Initial Level 2 Repeatable Level 3 Defined Level 4 Managed Level 5 Optimizing	Paulk et al., 1993
Risk Maturity Model	Level 1 Naive Level 2 Novice Level 3 Normalised Level 4 Natural	Hillson, 1997
Project Management Process Maturity Model	Level 1 Ad-hoc Level 2 Planned Level 3 Managed at project level Level 4 Managed at corporate level Level 5 Continuous learning	Kwak and Ibbs, 2002
The Business Process Orientation Maturity Model	Stage 1 Ad hoc Stage 2 Defined Stage 3 Linked Stage 4 Integrated Stage 5 Extended	Lockamy and McCormack, 2004
Maturity of the Performance Measurement Field	Stage 1 Budgetary control era Stage 2 Productivity management era Stage 3 Integrated performance measurement Stage 4 Integrated performance management Stage 5 Inter-enterprise performance management Stage 6 Environmental & social performance	Bititci et al., 2009

Therefore, in a similar fashion, there are levels of maturity or sophistication of FAC that can be established as a model or framework (Figure 13).

Figure 13 FAC Maturity Model – First step



Some of the maturity levels can be established deductively, by using the literature and applying logic. However, it is assumed that for internal validity, in an interventionist empirical study, applied research is required to ensure that the framework is robust and fit for purpose, especially when it will be used for assessing changes in FAC levels used by NPD management teams. Therefore this first empirical study confirms and inductively refines the FAC Framework.

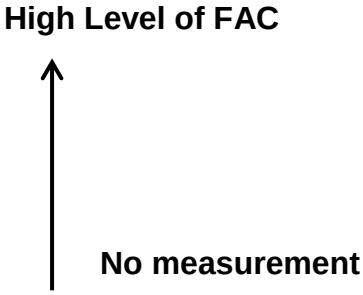
The deductive component of the FAC Framework development is presented in the next sub-section.

3.2 Deductive Development Of The Initial FAC Framework

The initial development of the FAC Framework can be achieved by using the output of the systematic literature review and the application of simple logic. The literature describes how FAC has been operationalized; anticipatory control, strategic value planning, scenario planning, forecasting, management controls and goal and target setting, evaluation and screening criteria, and feedforward controls and metrics. Starting with Figure 13 above, simple logic can be applied to this list to begin determining the different levels of FAC that may be used in the stage-gate meeting.

Firstly, if there was no feedback or feedforward measurement at all, logically this would have to be the lowest level of FAC. This can be labelled “No measurement” (Figure 14):

Figure 14 FAC Maturity Model – Deductive Step 1



Secondly, logic would suggest that scenario planning is not carried out unless the business is already doing forecasting or strategic value planning. Scenario planning is the weighing of alternative courses of action (Miller & Friesen, 1982; Karlsson and Åhlström, 1997) and evaluating trade-offs among NPD projects (Bisbe & Malagueno, 2009). It is highly improbable that a business would be doing scenario planning before it does forecasting (Figure 15):

Figure 15 FAC Maturity Model – Deductive Step 2

Next, simple logic would propose that a business would not be anticipating outcomes or forecasting until it has first captured feedback or actual performance. Also the setting of targets and target metrics would not be done until the business was already capturing actual performance and employing forecasting (Figure 16):

Figure 16 FAC Maturity Model – Deductive Step 3

High Level of FAC

Scenario planning

Forecasting / Strategic Value Planning **and Target Setting** (Burton et al., 1988; Kortge and Okonkwo, 1989; Bisbe and Otley, 2004; Poskela and Martinsuo, 2009; Bisbe and Malagueno, 2009)

Actuals reporting / feedback measures (Jørgensen and Messner, 2009; Micheli and Manzoni, 2010)

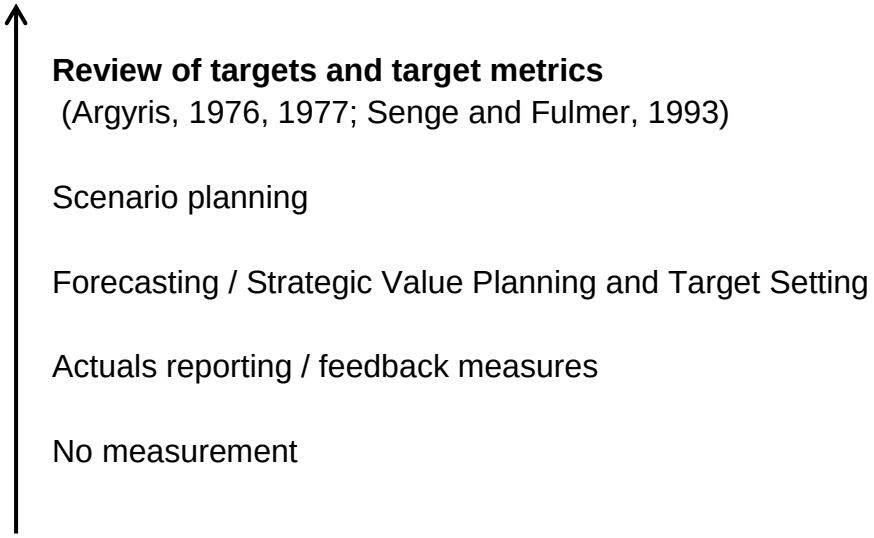
No measurement

Low Level of FAC

Double-loop learning, in feedforward loops (Argyris, 1976, 1977; Senge and Fulmer, 1993), with the review of the targets and target metrics, cannot be done unless there are targets that have been set in the first place. Logic and the literature would also suggest that an ultimate review of the validity of targets, at a high level of FAC, would not be done until completion of scenario planning. The underlying assumption being that management uses scenario planning to weigh-up and assess the anticipated outcomes of different product range build options or scenarios and assessing the output of the different scenarios helps validate or verify targets and goals (Figure 17):

Figure 17 FAC Maturity Model – Deductive Step 4

High Level of FAC

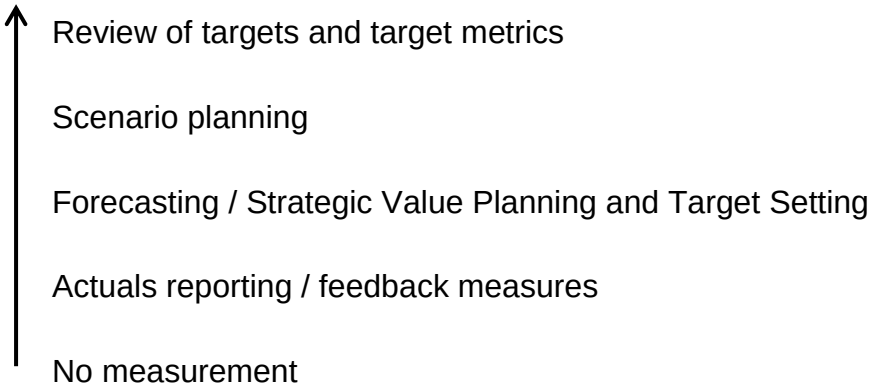


Low Level of FAC

Therefore, deductive development provides an initial FAC Framework, Figure 18:

Figure 18 INITIAL FAC MATURITY MODEL

High Level of FAC



Low Level of FAC

A specific purpose of this first empirical study is to confirm this initial framework and to refine it inductively, to provide a robust tool that can clearly categorize units of analysis by FAC Level, for the planned action research study.

The inductive refinement of the initial FAC Framework is developed from the findings of this empirical study and is presented in the results section.

3.3 Portfolio Performance Framework: The Need For Inductive Empirical Development

The second part of the research question requires capture of changes in portfolio performance in stage and stage-gate NPD. The methodology section argues the case for a research design that studies brands, in the footwear and apparel industry, as the unit of analysis. Therefore, to capture performance in the planned Project 3 action research study (Figure 19) requires a framework that effectively and comprehensively measures performance of the NPD portfolio.

Literature on performance management in the footwear and apparel industry is sparse. There is study of lead-time management and forecasting (Christopher and Peck, 1997), apparel costs and operational flexibility (Lowson, 2003), responsiveness and supply chain efficiency (Fernie and Azuma, 2004), product variety and portfolio modelling (Vaagen and Wallace, 2008), modelling the impact of apparel outsourcing (Kumar and Arbi, 2008) and the application of value stream management on a footwear component supply chain (Taylor, 2009).

However, there does not appear to be a robust and comprehensive framework for measuring changes in portfolio performance, in this under-researched industry. Therefore such a framework needs to be built to carry out the planned action research study. To achieve the purpose of this study therefore requires inductive development of such a framework. The inductive development of the Portfolio Performance Framework is presented in the results section of this project using the data captured in this empirical study.

3.4 Frameworks for Intervention

It is planned for the action research study (Project 3) to use the two frameworks of each of the two variables, FAC and portfolio performance, in an empirical study, where changes in levels of FAC and the resultant changes in performance are to be measured. Changing the levels of FAC requires intervention. Therefore the next

section on methodology considers the planned intervention approach and the use of the two frameworks in such an intervention.

4 METHODOLOGY

This section begins with an overview of what is covered in the methodology discussion.

4.1 Overview

The methodology section contains five parts. The first part describes the interventionist methodology planned for the action research study, changing the levels of FAC, capturing changes in performance, and why this requires the development of the two intervention variables frameworks. The second part discusses the research design, including the guidance implications from the systematic literature review and the research question. The selection of the unit of analysis is also considered and the contextual information of the selected cases is presented. Thirdly the field experimental method is considered including descriptions of the five protocols used in the study. There is also contextual information presented on the three “external” brands where data was captured for relevance purposes. The fourth part explains the method used for the inductive development of the two frameworks and the final part establishes the case for validity and reliability.

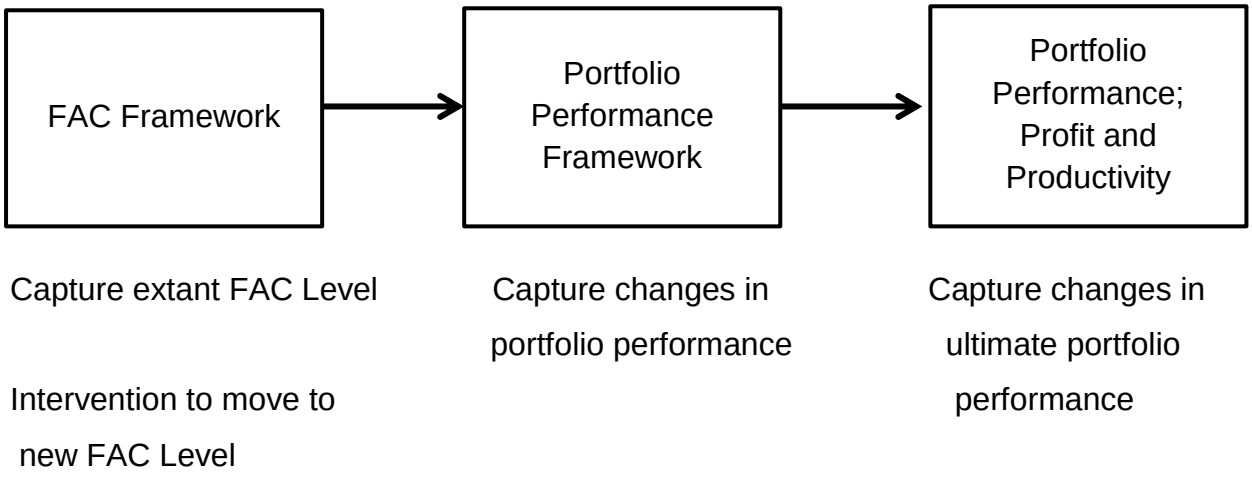
4.2 Intervention Methodology

Understanding how FAC influences NPD management teams can be studied by changing FAC levels and observing the effect on portfolio performance. This advocates applying an interventionist empirical research methodology. Also known as action research, this requires integral participation by the researcher with the intent of changing the organization. The research output needs to explain and demonstrate transparently how the specific intervention experience is related to the method (Eden and Huxham, 2002).

It is noted how valuable this type of research is in experimenting with complex theoretical frameworks, testing systemic relationships, ‘developing and elaborating theory from practice’, and revealing aspects from the change process that would be much harder to find in a steady setting. This methodology is also valuable in

developing emergent theory where the features cannot easily be identified by other approaches (Eden and Huxham, 2002).

Figure 19 Interventionist Research Methodology – Planned Project 3 Study



Rigour, reliability and validity can be established by a clear focus on theory elaboration and development, a high level of systematic method, replicable processes of exploration, critical interpretation of context and history, the use of data and methodological triangulation and clear research frameworks (Eden and Huxham, 2002; Denzin 1978a, 1978b; Gibbert et al., 2008). These are requirements that I need to consider in the design of both empirical studies of my research.

Figure 19 is a graphical model that represents the application of the two proposed resultant Project 2 frameworks in an interventionist approach for the planned Project 3 study.

Eden and Huxham (2002) also note the particular experiential and understanding demands made on the researcher using action research, those combining ‘consultancy and intervention’. These are particular skills, knowledge and experience that I am able to apply when selecting this methodology.

4.3 Research Design

The high-level interventionist research methodology has now been described. However, in the systematic literature review results there was also summary guidance obtained for empirical study of management controls and NPD, therefore

providing research design implications that need to be considered for this study. This section references that summary guidance and the methodology implications for addressing the research question and the selection of the unit of analysis. Next, the argument is presented as to why “the Brand”, in the branded footwear and apparel industry is likely to achieve the design and methodological requirements.

The next sub-section considers the implications of using the Brand as a unit of analysis. The sub-section also discusses the significant design benefits of using a Brand as unit of analysis, in a single group organization of Brands. That is multiple examples of the unit of analysis within a single design (Yin, 2009 p46). This design controls for many of the FAC moderators identified in the systematic literature review. This is also presented graphically, using the Project 1 results model.

The final sub-section provides contextual information on the selected brand cases within my Brands Group organization.

4.3.1 METHODOLOGY GUIDANCE FROM THE SYSTEMATIC LITERATURE REVIEW (PROJECT 1) RESULTS

In respect of empirical research design in the fields of management controls and NPD, the systematic literature review results in Project 1 found scholarly concerns around distortions caused by retrospective capture of data and information (Danneels and Kleinschmidt, 2001; Chiesa et al. and Noci, 2009; Richtnér and Åhlström, 2010), informant post hoc rationalization (Bonner et al., 2002; Saunders et al., 2005) and the difficulties and challenges to ascertain management controls impact when the actual market performance of the product is not understood or captured (Saunders et al., 2005; Chiesa et al. and Noci, 2009). Therefore in developing the research design for my empirical studies these challenges need to be addressed.

Extant literature suggests that these challenges can be overcome by using a longitudinal methodology that follows the product cycle through the NPD process and captures the product market outcome. Other guidance from the literature emphasises qualitative study to understand the dynamics and interplay between management controls and NPD, observing the links between constructs rather than the constructs themselves and multiple informants to enable data triangulation. The

systematic literature review results also identified that such research should concentrate on the stage-gates with subsequent follow-up interviews.

In summary, the conclusions from the systematic literature review guide the proposed empirical research methodology:

- longitudinal study that follows the NPD process (Danneels and Kleinschmidt, 2001; Schmidt and Calantone, 2002; Bonner et al., 2002; Saunders et al., 2005; Revellino and Mouritsen, 2009; Richtnér and Åhlström, 2010)
- qualitative study (Marginson, 2002; Christiansen and Varnes, 2008; Chiesa et al. and Noci, 2009)
- observing the stage-gate meetings, with follow-up interviews (Schmidt and Calantone, 2002; Saunders et al., 2005; Christiansen and Varnes, 2008; Richtnér and Åhlström, 2010)
- capturing product performance outcomes (Saunders et al., 2005; Chiesa et al. and Noci, 2009; Richtnér and Åhlström, 2010)
- observing the links between constructs (Revellino and Mouritsen, 2009)
- data triangulation (Davila, 2000; Bonner et al., 2002; Revellino and Mouritsen, 2009).

This is general guidance for the empirical study of management controls in NPD. Addressing the research question also requires consideration of feedforward controls, performance and intervention. Therefore there are further design and methodology implications to assess. This is covered in the next section, including discussion of the research design benefits of study in the branded footwear and apparel industry.

4.3.2. DESIGN AND METHODOLOGY IMPLICATIONS OF THE RESEARCH QUESTION

This sub-section considers the design and methodology specific issues of addressing the research question. The selection of the branded footwear and apparel industry as a suitable environment and context is also considered. The research question is: “How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?”

There are two parts to this question: firstly to understand how the control is used in the management of NPD and secondly to understand the effect on performance. When considering the methodology guidance from the literature review results, this suggests that any research design must first assess the “as is” situation and, if possible, next provide intervention (Cook and Campbell, 1979*)* to adopt or raise the application of the control and observe changes in performance. Therefore there are two projects requiring empirical research that determine the overall scope for Project 2 and Project 3, firstly that Project 2 assesses the *status quo* and Project 3 carries out a longitudinal qualitative interventionist study (Figure 19 and Figure 21).

For Project 2, even though the study is to identify how the control is currently being used, it will be important to select a unit of analysis that can be observed longitudinally and where the product performance data can be captured. It is also important for validity that a clear research framework is developed and used (Eden and Huxham, 2002; Denzin 1978a, 1978b; Gibbert et al., 2008).

The DBA timeline has to be considered when determining the research environment and context that will enable study of such process and outcomes. An industry with a relatively fast NPD cycle time is required. The branded footwear and apparel industry is an ideal industry to apply this methodology given the relatively fast “clock speed”. The NPD stage-gate process cycle time, from the new product “concept stage” to the “launch to market stage”, is typically between 26 to 52 weeks. During this process there are usually a number of stage-gate meetings, for example:

- approval from the computer aided design (CAD) drawings stage to the creation of the product specification stage
- approval from the product specification stage to the creation of the first physical prototype stage
- approval from the final prototype stage into the product range to be launched into market.

Therefore selecting a unit of analysis in this industry is likely to achieve the proposed design and methodological requirements. The benefits and considerations of using a unit of analysis within this industry are considered next.

4.3.3 UNIT OF ANALYSIS

This sub-section discusses why the selection of the “Brand” in the footwear and apparel industry is an effective unit of analysis in empirical study of the research question. The research design benefits of using multiple cases in a single organisation, to control for FAC moderators, is also considered.

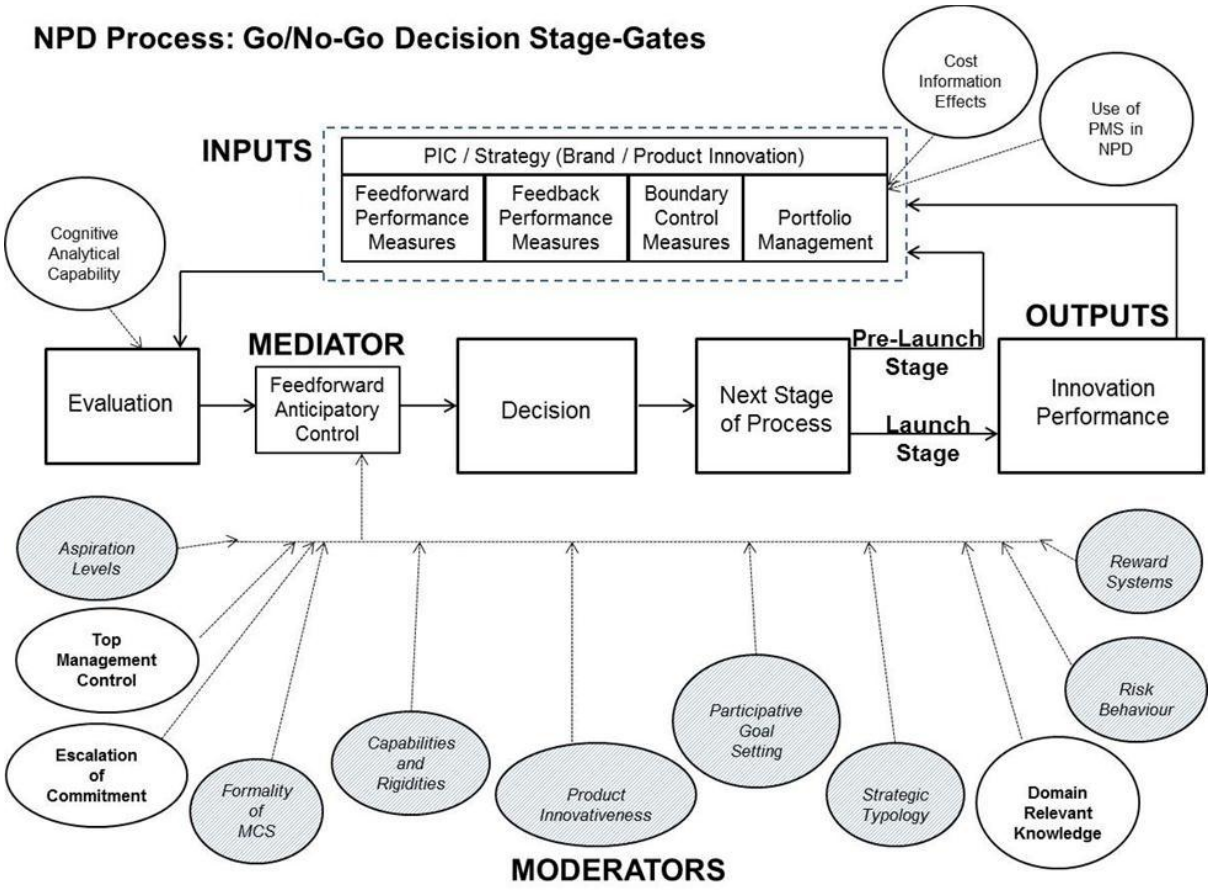
The product range build stage and stage-gate process is the general NPD approach used in the branded footwear and apparel industry. In determining the unit of analysis it is important to consider the significant brand market characteristics that differentiate brands and influence product range build. Such characteristics are:

- Brand positioning or other categorization continuums that are present;
    - product; fashion – technical
    - pricing; premium – commodity
    - brand maturity or lifecycle stage; immature - mature
- product categories; apparel, footwear, equipment, accessories
- number of markets the brand is sold in; national, continental or global
- gender specific; men, women, children.

These factors, in combination, will have a substantial impact on the brand’s approach to product range building NPD. Given that Project 2 is planned to develop a research framework in preparation for Project 3, the longitudinal study proposed for Project 3 helps select the unit of analysis for Project 2. To carry out meaningful research in Project 3 requires intervention at a level of unit of analysis where the intervention and performance changes can be studied distinctly between cases. It will also be necessary to observe any changes in the intervention variables, irrespective of the types of brand characteristics described above, that may be present. Also for Project 3, to achieve reliability and validity, it is necessary to have interventions with multiple examples of the unit of analysis. All these factors suggest that the unit of analysis should be the “Brand”.

My organization has a number of brands in the Group portfolio. These brands operate as separate subsidiaries, self-contained business units, within the Brands Group. Therefore in selecting these brands, they are being studied as embedded cases in a single organization. The research design approach is to use multiple examples of the unit of analysis within the same organization (Yin, 2009: Bourne et al., 2005).

Figure 20 Graphical Synthesis of P1 Systematic Literature Review Results



The shaded moderators (Figure 20) are those that can be controlled for in the research design.

There is a significant advantage to using this approach when considering the moderators identified in the systematic literature review output of Project 1 (Figure 20). These moderators can influence the application of FAC and can therefore enable or constrain NPD, and therefore performance, when FAC is being used. By using multiple examples of the unit of analysis in a single organization some of these moderators can be controlled. All the brands studied operate in the branded footwear and apparel sector and are all subsidiaries of the same group. Therefore the moderators controlled for are; aspiration levels, formality of management controls, product innovativeness, participative goal setting, reward systems, risk behaviour, capabilities and rigidities and strategic typology.

These moderators can be controlled for by the research design and the organization context. The individual brand strategies, targets and performance are all reviewed

and challenged by the same Group executives with each relevant set of brand executives. There is also a regular movement of individuals between the brands, a shared set of training programmes and a single Group management development scheme. Therefore the moderators of aspiration levels, formality of management controls, risk behaviour, and capabilities and rigidities can be controlled for in the research design.

There is a single approach to strategic business planning used by all the brands in the Group and the remuneration and bonus scheme is the same across the Group, approved and signed-off annually for all employees by the Group CEO. Therefore participative goal setting and reward systems can be controlled for in the design. Finally, the brands are all operating in the branded footwear and apparel industry, therefore controlling for product innovativeness and strategic typology.

The literature review in Project 1 identified moderators that can affect the application of FAC, that would still be present are (Figure 20): (the brand) top management control, escalation of commitment and domain relevant knowledge. It will be necessary in the planned action research study (Project 3), for validity purposes, to capture cross-case comparison on these moderators.

Each unit of analysis within the single organisation can be considered as a selected case. This project selected eight cases for study. The contextual characteristics of the selected cases are described next.

4.3.4 CASES SELECTED

This sub-section provides contextual information on the selected cases, describing the product categories sold, the age of the brand, time within the Group, brand revenue, the number of countries of sale and the number of employees.

Eight brands in the Brands Group were studied in this project (Table 5). The Group is head-quartered in Europe. Sport-One and Sport-Two were the two largest brands by revenue, both operating in the sports sector. Sport-One is predominantly an apparel and equipment brand, whereas Sport-Two only sells footwear. Both brands are sold in over 140 countries around the world and are two of the oldest sports brands, both over 50 years old.

Table 5 Brands Studied – Contextual Information

Brand	Product Categories	Age of Brand (years)	Years within the Group	Sales $m	Number of countries brand is sold in	Number of employees
Sport-One	Sports; apparel, equipment	>50	>20	515	>150	220
Sport-Two	Footwear	>50	>10	440	>140	208
Walk-One	Outdoor; apparel, equipment	>40	>10	115	28	175
Foot-One	Footwear	>40	>20	20	2	15
Foot-Two	Outdoor footwear, socks	>30	>10	12	3	17
Fashion-One	Apparel, footwear	>10	>5	5	2	8
Fashion-Two	Apparel, footwear	>20	>5	44	30	38
Fashion-Three	Footwear	>20	>10	20	8	18

Note: Foot-One and Fashion-Three also share a "back-office" of 16 people, in addition to the numbers in the schedule.

The next largest brand, Walk-One, operates in the outdoor market, with apparel being the biggest product category. Walk-One is focused on new market growth, especially in Europe and Asia. The brand is over 40 years old.

Sport-Two and Walk-One have both been in the Brands Group for over ten years, whereas Sport-One has been in the Group for over twenty years.

Foot-One and Foot-Two are "national" footwear brands, with very small international business. Foot-One sells casual fashion footwear and Foot-Two sells outdoor walking footwear.

Fashion-One, Fashion-Two and Fashion-Three all sell fashion product. The first two brands sell apparel and footwear and Fashion-Three sells only footwear. These brands are relatively younger, compared to the other five brands, and have been in the Group the shortest period of time. Fashion-One and Fashion-Three are the two smallest brands by sales revenue.

The combined sales of the brands in this study are $1.2billion and the businesses employ a total of 715 people.

It is these cases that were studied in this project, to develop the two frameworks for measuring changes in the variables of the research question. The high level experimental method for the empirical projects is discussed next and the protocols used in this study.

4.4 Field Experimental Method

This section considers the methodologies used to study the selected cases and the protocols required for each methodology. Overall, five protocols were used in this project.

This Project 2 empirical study is being carried out to obtain research frameworks for a longitudinal study in Project 3 (Figure 19). Two frameworks need to be developed in preparation for Project 3. This framework requirement is captured in Figure 21. Project 3 is planned as an interventionist study that intervenes in a brand, changing the level of use of FAC and capturing changes in portfolio performance. Therefore one framework is required as a control to assess the current level of use of FAC in the Brand and the subsequent change in FAC, and the second framework to assess changes in portfolio performance. The FAC Framework will need to be applied to a brand irrespective of the brand context. Both frameworks will require utility for all the brand interventions in Project 3. This means that both frameworks must be able to measure changes in FAC and portfolio performance for all the selected cases in the planned action research study.

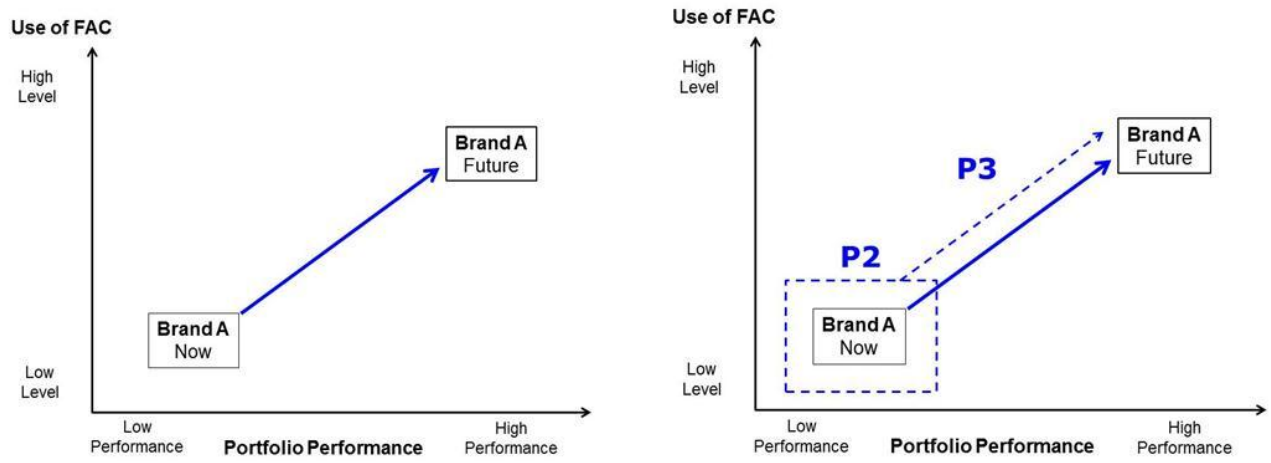
By understanding how FAC is being used in different brands and building on the literature findings, the framework will create a categorization of the different FAC

levels, in terms of maturity or sophistication, and of where each brand is against those levels.

Therefore the method used in this first empirical study must deliver the following outcomes;

1) descriptions of how FAC is being used in each brand studied
2) produce a framework for showing changes in levels of FAC
3) evaluate the level of FAC for each brand studied
4) determine how to capture changes in portfolio performance, with both “hard” metrics and “softer” management perception.

Figure 21 Field Experimental Method: High Level Design



From the methodology guidance from the systematic literature review, the data should be obtained from observing stage-gate NPD meetings, with follow-up semi-structured interviews. Seeking further data and methodological triangulation to improve construct validity (Eden and Huxham, 2002; Denzin 1978a, 1978b; Gibbert et al., 2008) focus groups, with managers from the brands as participants, were identified as an additional methodological tool.

The results of Project 1 identified the operationalized or the theoretical categorizations of FAC; anticipatory control, strategic value planning, scenario planning, forecasting, management controls and goal setting, evaluation and screening criteria, and feedforward controls and metrics. In this first empirical study,

it is these operationalizations of FAC that will be the target for observation, to help refine the initial FAC Framework (Figure 18). The protocols used will need to capture how management anticipate performance, make range planning decisions, set targets, use stage-gate screening criteria and create and use forecasts. Information that management consider would help and that could be made available, that is not currently used, should also be captured.

In developing the portfolio performance framework, to understand how product range build performance is assessed by management, the protocols used need to cover what information is used in performance management of range build, the use of feedback and feedforward metrics, what management consider is working well in managing range build and what is not working well.

It is important to note that in my empirical studies I use “portfolio performance” as the term or proxy for “range build performance”.

Five protocols were used (protocol details presented in Appendix K):

1) general aspects to be captured
2) observation in the stage-gate range review meetings
3) semi-structured interviews
4) focus groups
5) additional semi-structured interviews – “external” brands

The first four protocols were used with the above selected cases. In addition to these cases, for the purpose of relevance, semi-structured interviews were also carried out with “external” brands, protocol 5. The context of these brands is discussed next.

4.4.1 Additional semi-structured interviews – “External” brands

The research design for this study (Project 2) is based on a single organization with multiple examples of the unit of analysis. Developing and broadening the relevance of my research can be achieved by checking the concepts, performance management attributes and approaches to range building with external, competitor brands. This sub-section explains the additional interviewing of informants from “external”, competitor brands, to provide greater relevance. The contextual information for these brands is also presented in similar format to the selected cases (Table 6).

This data has been captured from four informants, representing three external brands (Table 6). These informants have all recently left these other brands and taken up management roles within the studied Brands Group. All the informants new roles in the Brands Group are similar to their previous roles in the external brands except for E Sport Brand B Key Account Manager who is now doing a Category Management role.

Table 6 External Brands – Contextual Information

Brand	Product Categories	Number of informants	Years at Brand	Role	Sales $m	Number of countries brand is sold in	Number of employees
E Fashion Brand A	Fashion Apparel	1	4	Sourcing Director	52	35	100
E Sport Brand B	Sports Apparel and Footwear	2	4 7	Footwear Merchandiser Key Account Manager	20,900,000	>170	38,000
E Sport Brand C	Sports Apparel and Footwear	1	2	Designer	4,050,000	>140	10,040

The combined sales of these three external brands is just over $24 billion and the businesses employ over 48,000 people.

The total external brand semi-structured interview time, for the three interviews, was 1 hour and 32 minutes.

The findings and results from these external brands have been presented alongside the results from the brands in the core study. Presenting the external brand findings in this way helps identify whether or not there is greater relevance to the research. A comparison is also made on review meeting participation and the issue of “control versus creativity” identified in the systematic literature review.

In summary, five protocols were used. The different methodological approaches required this number of protocols, including the use of semi-structured interviews with the “external” brands to support the relevance of the research.

Once the protocols were used and data collected two key questions were applied to the data. These questions and the methods for developing the two frameworks are explained in the next section.

4.5 Brands and Method Applied

This section describes the questions asked in analysing the data, the methodology applied in developing the two frameworks and a summary of the research methodologies that were used for each brand. Firstly the use of multiple methodologies is discussed and the key questions asked when analysing the data.

Next the inductive development stage of the FAC framework is described after which the inductive development of the Portfolio Performance Framework is also covered. A summary of the research methods by brands is next presented, after which the types of documents made accessible for the research are noted. Finally the sequencing of the study is described and the final stage empirical activity of sense checking the two resultant frameworks with 15 key informants, for enhancing reliability.

The single set of data collected from this research is used to develop both frameworks. The analysis and coding of the data is carried out using two separate lenses, one on how FAC is being used and the second lens on how management evaluate portfolio performance.

The key purpose of using the multiple methodologies of observing meetings, semi-structured interviews and focus groups in this research design is for data and methodological triangulation (Yin, 2009 pp114-116; Miles and Huberman,1994 pp266-267) and to achieve coding and theoretical saturation, where no new categories are found (Partington, 2002 p151) . The use of triangulation supports construct validity, which in turn improves reliability (Gibbert et al., 2008; Yin, 2009; Miles and Huberman, 1994).

The key questions asked when analysing the data were:

1) For developing the FAC Framework: “What example is this of FAC, as operationalized in the literature?” and “How is this type of FAC being used?”
2) For developing the Portfolio Performance Framework: “What evidence is this of the performance management of product range build?”

The methodological steps taken in the inductive development of the FAC Framework and the Portfolio Performance Framework are described in the next two sub-sections.

4.5.1 FAC LEVEL FRAMEWORK – INDUCTIVE DEVELOPMENT STAGE

The initial development of the FAC Framework was used as a starting point (Figure 18). The next step was to capture from the data the examples of FAC and how they are being used by the brands in range building and stage-gate NPD. The output from this analysis was used to sense check, strengthen and add to the initial basic framework. The development of this analysis is presented in the results.

An emerging concept within FAC was identified at this stage, with the role of the “FAC metric”. This provides additional structure to the framework. The role of double-loop learning (Argyris, 1976, 1977; Senge and Fulmer,1993) is also reviewed and is built into the framework. The FAC metric is discussed and defined in the results.

4.5.2 PERFORMANCE FRAMEWORK – INDUCTIVE DEVELOPMENT

This sub-section describes the inductive development methodology for the second framework, the Portfolio Performance Framework.

In the results section of this study, the resultant codes have been developed out of the data. This evidence is presented in a clear and traceable chain (Gibbert et al., 2008; Yin, 2009 p122).

To begin development of the Portfolio Performance Framework from the data a ‘line-by-line, whole sentence and paragraph’ analysis open coding of the data was undertaken (Strauss and Corbin, 1998). The open coding approach analysed each transcription ‘sequentially, extensively and in detail’, with no pre-existing reading applied. “Meaning units” were found and aggregated into ‘concepts that bind together the individual partial units’, resulting in the ‘interpretation controlling the data collection’ (Reichertz, 2004).

The initial step of the coding process was to label the features of performance in the margins of the transcripts. These labels were next summarised for each review meeting observed, each interview and each focus group. The summary of this initial coding activity is presented in Appendix N. For the semi-structured interviews this can be tracked to the individual informant/role in each brand.

These labels were next analysed to develop the categorizations of portfolio performance. These results are presented in a matrix (Miles and Huberman, 1994 p93) with the Brands in the rows and the research methodology in the columns (Appendix O). The performance categorizations emerged from this data, using a grounded approach (Strauss and Corbin, 1998 p12) to 'offer insight, enhance understanding and provide a meaningful guide to action'.

The next step was to identify measurable subcategorized dimensions (Strauss and Corbin, 1998) of performance. This was done by revisiting the "performance" labelled areas of the transcripts, now summarised in the performance categorization schedules (Appendix O). The process of building the summary categorization schedules in Appendix O reveal the emergent key measures of performance for populating the sub-categorization dimensions. Relevant quotes were captured by identified sub-categorization and analysed for measurable dimensions of performance. The available Brand documents were also reviewed for performance measures assessed by management, especially for those measures used in range review stage-gate meetings.

The crucial sub-categorization selection characteristic applied to these results was the capability for use in the planned action research study (in Project 3). The detailed characteristics being that these dimensions were considered by management as significant to evaluating portfolio performance and also the ability of these dimensions for developing relevant research questions and protocols for capturing portfolio performance data.

The "hard" metrics emerging from the data have been captured with the same method.

The different research methods used across the selected cases are described next.

4.5.3 SUMMARY OF THE RESEARCH METHODS USED BY BRAND

This sub-section presents a summary of the research methods used with each brand (Table 7). The schedule presented shows the level of research activity for each of the three methods; observing review meetings, semi-structured interviews and focus groups.

Table 7 Summary of research methods by brand

BRAND	Review Meeting Observation	Semi-Structured Interviews	Focus Groups
Sport-One		2	13 participants
Sport-Two	11 participants (2hrs 0mins)	2 + One group of 6 interviewees	
Walk-One	10 core participants (maximum of 22 participants) (6hrs 30mins)	6	10 participants
Foot-One	9 participants (2hrs 15mins)	1	
Foot-Two	11 participants (5hrs 25mins)		
Fashion-One		1	
Fashion-Two		One group of 4 interviewees	14 participants
Fashion-Three	15 participants (3hrs 40mins)	4	
TOTAL EVENTS	5	18	3
TOTAL PARTICIPANTS	56	26	37
TOTAL TIME	19hrs 50mins	9hrs 25mins	1hrs 30mins

The general aspects protocol and the range review meetings protocol captures contextual, process and content findings from each brand review meeting observed. These findings are presented in the results, including a cross-case comparison.

These findings provide additional evidence for validating the FAC level that each brand is currently operating at.

The roles of individuals participating in the review meetings and focus groups, and as informants in the semi-structured interviews are presented in Appendix L. The breadth and depth of roles present in the research covers all levels of management hierarchy in the brands and also a full cross-functional representation of the roles involved in product range building. In contrast to taking a narrow and shallow functional perspective, this broad and deep role representation helps provide greater rigour and reliability to the findings. Descriptions of industry specific roles, involved in the study, are presented in Appendix M.

The output of this study will be frameworks for use in a subsequent empirical study. Therefore not all brands will require the application of all the methodologies if corroborative 'multiple instances' (Miles and Huberman,1994, p267) and theoretical saturation is achieved. Both these thresholds were achieved before all the data was captured from each brand/method activity as shown in Table 7. Theoretical saturation was achieved and the amount of data collection necessary was sufficient to achieve the objectives of the study.

4.5.4 DOCUMENTS

Category management strategy, product category range plans and range review meeting documents were accessible from all the brands except Fashion-One and Fashion-Two. The accessed documents were used in the observed review meetings and they were also used as a reference in the semi-structured interviews. The documents are also used to support the analysis in developing the findings and results.

4.5.5 SEQUENCING OF THE EMPIRICAL RESEARCH

In this final section on the field experimental method it is helpful to describe the scheduling of the empirical study given the rigour, validity, relevance and reliability targets of the project that has required collection of a significant amount of data.

The initial empirical schedule was dictated by the seasonal timings of the product review stage-gate meetings. For all the brands where the product review meetings

were observed, the semi-structured interviews were carried out shortly afterwards. Two brand focus groups and semi-structured interviews were also carried out in two brands where it was not possible to schedule an observation of the product review meetings. This research was carried out during the same period as the other brands.

The additional semi-structured interviews with the “external” brands, for relevance purposes, were conducted next. This enabled contribution of the data into the coding development.

The final stage of the empirical work was the sense checking of the resultant frameworks with key informants in the brands, for reliability purposes. After final development of the two frameworks, into a “provisional” result, they were presented to interview informants and range review meeting participants for sense checking. This review of the results with knowledgeable informants (Kumar et al., 1993: 1634) is an important activity for determining reliability (Miles and Huberman, 1994 p278).

The two frameworks were sense checked with 15 key informants and managers across the brands. The informants’ brands and roles are presented in Table 10. A consistent approach was used in presenting the two frameworks. The protocol used to present the results is shown in Appendix Q.

The total research time for this final part of the empirical work, sense checking the two frameworks with informants, presenting the frameworks and capturing comments, was 5 hours and 40 minutes.

4.6 Establishing Rigour: Reliability and Validity

The validity considerations for both Project 2 and Project 3 need to be considered at Project 2 given that the Project 2 aim is to create research frameworks for the longitudinal action research empirical study in Project 3 (Figure 19 and Figure 21). This requires validity in both the Project 2 development of the frameworks and overall validity for Project 3, establishing the change in the level of FAC use and the changes in portfolio performance. The methodological approach and applied rigour also provides greater reliability of the results.

4.6.1 INTERNAL VALIDITY AND CONSTRUCT VALIDITY

Validity is demonstrated in this study by the methodology addressing construct validity and internal validity and also the use of data and methodological triangulation.

4.6.1.1 Construct Validity

Construct validity refers to the ‘quality of the conceptualization’ or the operationalization of the concept and the extent to which ‘a procedure leads to an accurate observation of reality’ (Gibbert et al., 2008). In this study the presentation of the protocols and the transparent development of analysis and coding from the data demonstrates, with traceability and replicability, how decisions and judgements were made. This exhibits a ‘clear chain of evidence’ and the journey from research question to conclusions (Gibbert et al., 2008).

The use of data and methodological triangulation in this study also supports construct validity.

4.6.1.2 Triangulation

Study findings or conclusions are ‘likely to be more convincing and accurate’ and allow ‘convergence of evidence’ if they are based on triangulation using several different sources of data and information (Yin, 2009 pp114-116). This study has used four main sources of information and data collection, with multiple participants and informants; observing stage-gate NPD review meetings, semi-structured interviews, focus groups and product range planning reports and documents. This approach represents both data and methodological triangulation. The findings from each data source and method are analysed together to enable ‘convergence of evidence’ and ‘corroboration’ using ‘multiple measures of the same phenomenon’ (Yin, 2009; Miles and Huberman,1994).

It is this use of triangulation that supports construct validity.

4.6.1.3 Internal Validity

Internal validity needs to be considered at this stage for the planned action research study in Project 3. Internal validity denotes ‘the causal relationships between variables and results’ (Gibbert et al., 2008). To demonstrate that the intervention of changing the level of FAC sophistication has an influence on NPD management

requires ‘clear research frameworks’ and using ‘pattern matching’ that compares ‘empirically observed patterns’ of different case interventions (Gibbert et al., 2008).

Trochim (1986) observes that Cook and Campbell (1979) and others ‘strongly favour replication treatment effects as a standard for judging validity’, though developments in experimental methodology ‘allow increased emphasis to be placed on the role of pattern matching’ (Trochim, 1986; Gibbert et al., 2008).

Also, as noted in the introduction, validity can be established by a focus on theory elaboration and development, quality of systematic method, replicable exploration processes, critical interpretation of context and history, the use of data and methodological triangulation and clear research frameworks (Eden and Huxham, 2002; Denzin 1978a, 1978b; Gibbert et al., 2008).

Overall, this suggests that the empirical action research study (Project 3) will need to be carried out with a number of examples of the unit of analysis. It also confirms the importance, for internal validity, of having frameworks for FAC and portfolio performance developed through rigorous applied research.

4.6.2 RELIABILITY

The methodological approach used in this study provides greater reliability of the results. Reliability denotes the ‘absence of random error’ (Gibbert et al., 2008). This greater reliability is achieved through the presentation of the field study protocols, the clarification of the research procedures, data and methodological triangulation and the transparency, traceability and replicability of coding development.

Also the addition of findings from “external” brands not only augments “relevance” it also supports reliability. Similarly, the sense checking of the two resultant frameworks with knowledgeable informants also enhances reliability.

Reliability in my first empirical study has also been strengthened by using informants that represent all the functions involved in NPD, including informants at Senior and Junior management levels. The informants also represent all the functions participating in the observed range review meetings and the focus groups. The large aggregate market size of the brands studied also reinforces validity and reliability.

The findings of this research are significant for the Brands Group being studied and also for the branded footwear and apparel industry in general, which is a significant industry sector. Therefore the validity emphasis is on construct and internal validity, which further enhances reliability.

The rigour applied to the development of the two resultant frameworks in this study provides validity support for the planned final empirical study (Project 3).

5 RESULTS

The results are presented in six sections. Firstly the FAC Framework is developed, initially from literature and logic, and further from the empirical findings. Secondly the Portfolio Performance Framework is developed with the findings on categorizations and sub-categorizations of NPD portfolio performance. Thirdly a cross-case comparison is presented on the studied brands' FAC levels of sophistication. Fourthly a summary of external brands findings is discussed and fifthly the results of sense checking the frameworks with informants. The last section is a reflexive discussion on the overall results achieved.

5.1 Inductive Empirical Development of the FAC Framework

The empirical findings are next used to further develop the initial framework (Figure 18) into the final framework. The final FAC Framework identifies eight levels of FAC sophistication that can be applied in stage-gate NPD (Figure 29).

The FAC Framework is required for the planned action research study, so that changes in the level of use of FAC, by intervention, can be captured and described (Figure 19). The framework will need to position the FAC level of each unit of analysis, before and after intervention.

The empirical evidence shows that the higher levels of FAC represent advancement or greater development in portfolio planning management controls than at the lower levels. To describe the changing levels of development two words were considered, either "maturity" or "sophistication". The Oxford English Dictionary definitions of these two words are:

Maturity; '*fully grown or physically developed, careful and thorough*'. This definition seems to relate more to "behaviour".

Sophistication (of a system or technique); '*highly developed and complex'*. This definition seems to align better to a systems and control perspective.

The definitions and the empirical findings demonstrate that the higher levels of FAC indicate a higher level of achieved and consolidated management controls development. Given that FAC is based in management control systems theory and that the different FAC levels represent management controls development, the word "sophistication" has been used to characterise the changes between levels.

5.2 Empirical Data

The empirical findings are presented in five sections. Firstly, the FAC Framework is further developed using the findings and results from empirical data. Next, in the same approach, the Portfolio Performance Framework is developed. The third section is a cross-case comparison in relation to the findings, by brand, on the levels of FAC being used and observations of the review meetings. The fourth section presents cross-comparison findings, from the three External brands, on range review meeting participants and the key systematic literature review finding on "control and creativity". The final section captures the knowledgeable informants' sense-check view of the two frameworks that represent the output of this project.

To assist traceability, the methodological source and informant, where relevant, is presented against each quote used. Representative and illustrative quotes are presented in tables.

5.2.1 THE FAC FRAMEWORK – EMPIRICAL RESULTS

In this results sub-section the initial FAC Framework (Figure 18) is further developed by application of the empirical findings. Eight levels of FAC sophistication are identified and the development of each level is presented in order of increasing FAC sophistication, as shown in the initial framework. The addition of the new FAC levels and the refinement of categorization labelling is developed and presented along with supporting data from all three methodology findings.

The eight levels of FAC sophistication identified, in order of increasing FAC sophistication are (Figure 29):

- No Measurement
- Actuals Reporting (feedback measures) (volume/revenue/margin)
- Product Category level forecasting (anticipated outcome) and Target Setting (volume/revenue/margin)
- Product level forecasting through the NPD process with a Strategic Fit Check
- Product Category Level FAC metric; reporting actuals and setting targets
- Scenario Planning / Forecast Review; Product level forecast (volume/revenue/margin)
- Product Category level review of targets (volume/revenue/margin)
- Product Category level review of the FAC metric target.

5.2.1.1 No Measurement / Actuals Reporting

I now start with discussion of the lowest FAC Level, “no measurement”. None of the brands in the study exhibited this lowest level of FAC sophistication. All the brands have adopted some form of FAC in their range build process. Though some informants noted situations where no controls were used at all.

Fashion-One: Managing Director
‘*The process I inherited was done on a “whim”*.’

Walk-One: Category Manager Lisa R
‘*It’s more gut feel than science.*’

Foot-One: Category Manager
‘When I arrived 18 months ago the range build was purely creative, there was no focus, no vision or shared goals.’

Foot-Two: Review Meeting
‘*In the past we just put the product on the table and said “what do you think?”*’

These findings confirm, as expected, that the lowest level of FAC sophistication, Level 0, is “no measurement” (Figure 22).

Figure 22 FAC SOPHISTICATION FRAMEWORK
Inductive Development – Step 1

High Level of FAC

Review of targets and target metrics

Scenario planning

Forecasting / Strategic Value Planning and Target Setting

Actuals reporting / feedback measures

Level 0	**No measurement**

Low Level of FAC

All the brands use some form of feedback historical sales performance analysis. The importance and value of this level of data and control was clearly stated across the brands. The findings also show that brand NPD management analyse the data at different levels of product hierarchy; gender, product category, style, and style and colour-way.

Fashion-Two Group: Product Director
‘*We’ve usually used historical information.*’
‘It’s difficult to build a range when you haven’t got solid feedback information.’

Foot-One: Category Manager
‘I’ve brought in the importance of looking at the lessons learnt, history and performance, the shape and infrastructure at product level of what was sold, sales of particular “kits” [footwear sole units].’

Fashion-One: Managing Director
‘*I look at it as a retail merchandiser, using historical data.*’

Walk-One: Category Manager Lisa R

'*We use history, based on the type of product.*'

'*I look at what have I done in the past, what's changed in the playing field, "changes in the landscape".* '

Sport-One: Supply Chain Team Leader

'It's difficult because each Category has got different challenges. If you look at equipment, the product tends to be a lot less seasonal. You find that 80% of the range tends to run on. So you wouldn't have the peaks and troughs you have for seasonal categories. [In equipment] 80% of the product will run on for 3 or 4 seasons. So you've got quite a bit of sales history to look at, you've got previous history, whereas on the key sports category you've got seasonal product, product that lasts for one season that doesn't necessarily replace something else.'

'*To sense check the forecast we're probably looking at what we did the last season or comparative season.*'

Sport-One: e-Commerce Team

'We also understand some top level numbers such as gender and gender splits, how we've sold the gender. We now understand numbers on colour better, e.g. brown shoes in Germany.'

'*The buyers do this by knowing which direction the market is taking. Whereas we use a lot of data that is retrospective in nature.*'

Style and colour level feedback data is used extensively in review meetings. For example:

Fashion-Three: Review Meeting:

'*This is a best-selling style.*'

'*Last season we had five (colour) options and two special make-ups, a total of seven SCOs that did €80,000.*'

'*Blue is the most popular colour after brown, in the buckle option.*'

Sport-Two: Review Meeting:

'*The striped version did 30,000 pairs in Q1.*'

'*Tan is the colour-way that's sold out.*'

Walk-One: Review Meeting:

'*This style did 4,200 units two years ago and 2,800 units last year*'

Foot-One: Review Meeting

'*Most of our customers have been questioning why we haven't had sandals for three years.*'

'*We need to check what's worked. Is it the tramlines or the apron? We've got four SCOs, two on the tramlines and two on the apron for spring summer.*'

'*That make-to-order is going stale because we haven't been doing anything for two years.*'

'*We used to do really well with big chunky wedges.*'

'*We have confidence because we did sell something well here last year.*'

'*We sold 1,600 pairs of the patent leather version across the three colours.*'

External Fashion Brand A: Sourcing Director

'*Merchandisers used a mix of Sales feedback and historical* [sales] *analysis to say this is how many T-Shirts, this many knitwear, this many trousers. This was used to create the initial "bones" of the range plan.*'

'*Before we could have the meeting each section of the people in the meeting had to bring certain information to it. The Designer and Developer would have to have the prototype there. I would have to have the initial cost price. And therefore working through with merchandising we'd have the estimated margin information. And also the Merchandising team would come in with historical sales of similar product, where we sold it, what colour sold and what colours didn't sell. We'd have CADs or presenters from the previous season product. So quite often a discussion would be "Why on earth do you want that in the range because you had it in the range last year and it didn't sell?"* '

External Sport Brand B: Merchandiser

'*From UK Merchandising we briefed Global Design in the USA. We gave a full deck of latest financials, retailers, sell-through, consumer, category level performance; running, football, sportswear, mens, kids, womens. There was a merchandiser for each category; running, football, sportswear, basketball. We included trends and opportunities, competitor activity and opportunities/gaps. We did a lot of influencing "upwards", a lot of lobbying, we had to put our pitch in for a shoe. It was an in-country merchandising function, which then went up to regional, regional would then go to Europe or straight to Global.*'

'*We also had seasonal meetings where we would also discuss causes of margin*

changes in categories. It was monitored and it was discussed. Global margin targets and expectations were set. We'd have to give commentary to explain any market factors, where we were deviating from what was expected.'

The findings show that "actuals" reporting and feedback measures are widely used by all the brands in the study, including the external brands, as control information in the product range build process. These results therefore confirm the next higher level of FAC sophistication, Level 1, as "Actuals reporting (feedback measures) volume / revenue / margin" (Figure 23).

Figure 23 FAC SOPHISTICATION FRAMEWORK
Inductive Development – Step 2

High Level of FAC

Review of targets and target metrics

Scenario planning

Forecasting / Strategic Value Planning and Target Setting

Level 1	**Actuals reporting (feedback measures) Volume/Revenue/Margin**
Level 0	No Measurement

Low Level of FAC

5.2.1.2 Forecasting

The next level of FAC sophistication is at the initial deductively identified level of forecasting and target setting. My review of the findings suggests that there are three different categories on forecasting. The first category recognises that for some brands forecasting is not a control activity that they are involved with at all, or, if the brand does carry out forecasting the quality of the process and the output is seen to have little value. This category is the "No forecasting and poor quality forecasting".

Based on the initial FAC Framework, forecasting and target setting was the next expected higher level of sophistication, above "actuals reporting". However, my

review of the findings showed that there are two distinct FAC levels of forecasting. The first level recognises that a product range can be sub-divided into “product categories”. This is a next step categorization of the overall range by management, below “total product range”, where management are looking for control with easily identifiable and sizeable groups of products. This categorization is termed “Product category level forecasting and target setting”.

The next higher FAC level of forecasting is markedly more sophisticated and combines three activities, product level (SCO) forecasting, that is carried out at multiple points through the NPD development cycle and also involves a sense check, at product and product category level, of the strategic fit of the range (Saunders et al., 2005). This categorization is termed “Product level forecasting through the NPD process + strategic fit check”.

5.2.1.2.1 NO FORECASTING AND POOR QUALITY FORECASTING

This is the first forecasting categorization identified from the findings. The data shows that a number of brands in the study did not carry out any forecasting activity at all; Foot-One, Fashion-One, Fashion-Two and Fashion-Three. From a cross-case comparison perspective this classifies all these four brands into FAC Level 1. Below are examples of related information captured from Foot-One and Fashion-Two:

Foot-One: Category Manager

‘*So far in the range review meetings there are no forecast of volumes, they are not discussed at all.*’

Fashion-Two Group: Managing Director

‘*We do zero on forecasting. Nobody is saying for Autumn Winter season that’s our sales target, how many SKUs does that mean we need*.’

Fashion-Two Group: Sales Director

‘*My judgement is, personally, on how I view it commercially.*’

For building the FAC Framework, it suggests that a brand not engaging in any type of forecasting will not achieve a FAC sophistication level any higher than Level 1.

Sport-One and Walk-One carried out forecasting, at Category and product (SCO) level but placed little value on the process or the output.

Walk-One: Category Manager Lisa R

'*We don't really know where the forecast numbers come from, we don't have great confidence. There could be more confidence if we could see how it is built*'.

Walk-One: Merchandising Manager

'*My first question is – really?! I am very cynical about forecast judgements from Product* (Management) *to justify it being in the range.*'

Sport-One: Supply Chain Team Leader

'*There's no process. There is no standardised way of setting a forecast within the business, at the moment.*'

'*There is some formal sense checking happening by the planners, or Finance, which is another challenge. We've got this forecast in the middle which no-one believes. So we've got planners sense checking it before it goes out to vendors, we've got Finance checking it before it goes out to any business planning etc.*'

5.2.1.2.2 PRODUCT CATEGORY LEVEL FORECASTING AND TARGET SETTING

The next level of FAC involves the first use of forecasting which, as expected from the systematic literature review results, helps management anticipate outcomes of range build performance (Makridakis, 1986; Simons, 1987; Chiesa et al. & Noci, 2009).

The application of forecasting at the next level is only a marginal step on from having an overall high level plan, in that the product range is sub-divided into "product categories". These product category classifications are developed because management are looking for control at a level where performance can vary significantly in easily identifiable, sizeable, groups of products. This more categorized level of anticipating future portfolio performance is for management control purposes (Burton et al., 1988; Simons, 1994; Marginson, 2002; Bisbe and Otley, 2004).

In the data presented below, the informants note 'looking at the bigger picture', 'having clarity on categories', reviewing 'different segments', assessing the volumes,

growth or decline of categories and also about planning, forecasting and setting targets at the product category level.

Walk-One: Regional Sales Manager

'*We need to look at the big picture. It will help on product decisions in the review meetings.*'

Fashion-Three: Managing Director

'*I think the one thing we are not sharp enough on is the clarity on our categories, now that, we're almost sort of having to backtrack now and re-categorise our range in order to sort of drive the value of the data that we're capturing. So, for me, once we've got that right and we've got clarity on how many SCOs, price points, in which category we need, at the moment we are not 100% at that level. So that's the next stage for us, that would help massively. At the moment we're at a stage where we're still working on pretty much the overall SCO count rather than drilling down into more detail.'*

'*If you were to look down at that category, first of all at the top you would have a very clear definition of what it is, who it is aiming at, the size that we need that collection to be, so on and so forth. Then below that, once you've got the product you're making decisions, a little bit more information around it, or a little bit more insight into where you need to get to at the end. I mean we got to where we needed to get to in that meeting but we could have quite easily not got there because it was not focused enough in small areas, categories.*'

'*We've got this overall SCO count and we'll drive down those figures. But we're not yet sitting up-front in the meeting saying this category, this is what the return is going to be.*'

Fashion-Three: Head of Supply Chain

'*We look at what's previously sold, we're looking at the different segments. And then the consumer segmentation work that Marketing have done, in terms of who is the consumer, where are they going to be buying and what types of products. And we've just tried, that's actually done quite unscientifically but we do have what we feel is a target. And of course, it is just obviously a target.*'

Sport-One: Supply Chain Team Leader

'*We want to get that information before forecasting, in February. So we've got a rough idea by category what we can expect to grow or decline.*'

Sport-Two: e-Commerce

'*If you made all the decision on pairage you would toss that product category away on volume. It might only be 2% of volume but is 12% of revenue.*'

Sport-Two: Business Analyst

'*We really need to get a grasp on carryovers and the main range as well, really looking well in advance of them planning a range, how many shoes they need to be making and of what type. Just getting those targets. It's all about planning and forecasting.*'

Sport-One: Category Manager

'*When we do the original category planning for the season, so we're working out our seasonal process, I like to review numbers on an annual and monthly basis, kind of looking at financial reports for the year but often when we're looking at SCO level detail and range planning for the season, it's obviously seasonal.*'

Foot-Two: Review Meeting

'*Those three new areas could each generate €0.5m of revenue. Yes, it's a stretch, but the execution is key.*'

Figure 24 FAC SOPHISTICATION FRAMEWORK
Inductive Development – Step 3

High Level of FAC

Review of targets and target metrics

Scenario planning

Level 2	**Product Category level forecasting (anticipated outcome) and Target Setting Volume/Revenue/Margin**
Level 1	Actuals reporting (feedback measures) Volume/Revenue/Margin
Level 0	No Measurement

Low Level of FAC

Category level forecasting is a relatively simple but significant first forecasting step for the brands. Therefore this level of FAC sits above Level 1and can be described as “Product Category level forecasting (anticipated outcome) and Target Setting volume / revenue / margin” (Figure 24).

5.2.1.2.3 PRODUCT (SCO) LEVEL FORECASTING THROUGH THE NPD PROCESS AND STRATEGIC FIT CHECK

The findings are similar to the study of Saunders et al. (2005), carried out in the consumer packaged goods FMCG sector, discussed in the systematic literature review, where the screening criteria applied by management at each stage-gate check the product value proposition with “fit to the firm”. The findings of that study also noted five stage-gate evaluation points; initial screen, detailed screen, pre-development evaluation, pre-commercialization review and post-commercialization review. Again this is similar to the findings from this study, where the screening criteria can be applied through the NPD process.

Building up the forecast at product level takes considerably more resource, effort and capability than at the higher product category level, the level described in the previous section. Management take this next step in FAC sophistication to further help anticipate the market outcome and validate and check for strategic value (Godener & Soderquist, 2004; Holmes & Campbell, 2004; Poskela & Martinsuo, 2009).

Therefore this management control represents a higher level of FAC sophistication than simply category level forecasting and category target setting.

The findings in this sub-section are separated into two parts, firstly the findings on the use of forecasting at product level and secondly the findings on the “strategic fit check”.

5.2.1.2.3.1 FORECASTING AT PRODUCT LEVEL

The findings on the use of forecasting at style and SCO level note the search for “winners” at product level and the planning at product level through the various stage-gates in the NPD cycle.

Walk-One: Category Manager Mike C

'*Having a stage to finally lock down the forecast is new*'

'*We plan to forecast at style level. That style forecast will drive a sense check of the SCO investment we're going to make.*'

Sport-Two: Category Manager

'*My forecasting is predominantly on judgement, looking at patterns, always looking for what could be the big seller. It can be "natural selection", it rises to the top, I know I can forecast big on this.*'

'*I forecast through the key stages; line planning, line review, second prototype and final line review.*'

'*Sales guys can tell you what's happened but they can't tell you the future. But they do give you nuggets – "this is being discounted" or "this style has got something going". Category managers are much better at forecasting overall product volumes than Sales.'*

'*The more you look at product through development the more you can see what is going to win. From CAD stage I know whether it should sit in the line*.'

Fashion-Three: Managing Director

'*Fundamentally there's enough information in that room plus we know we have its successor on the floor. And therefore the decision becomes a lot easier. You know you've got the next product that's capable of taking that business. We've already introduced it for one season, so we've got one season's performance.'*

'*One thing that came out, after the review meeting last week, the Sales team are fully forecasting against the whole collection.*'

Fashion-Three: Design Manager

'*The Sales team come out of that* [review] *meeting and then do their forecast.*'

Sport-One: Supply Chain Team Leader

'*So it'll be "this is a comparative style to this", therefore it could be doing this, but it's green and we know green has been doing this recently. Or its male and we know we're pretty flat on male. Just putting a bit more detail behind it and a bit more…, at SCO level.*'

'*The forecasts are all done at style and SCO level by the Category Managers but they tend to be quite "adventurous"*. *Obviously the Category manager wants to develop products that will do well. And they're not going to develop a product if they don't think it's going to do well*.'

'*I don't think the Category Managers understand the impact of not having more accurate forecasts. Well I think they understand it but the fact is they want to keep it in the range, so it's going to be quite biased.*'

'*It's difficult. Ideally we would like to go out to market level and do a full forecast by SCO by market. But that's a big piece of work. It's probably not possible but something we need to look at, maybe next season.*'

Sport-One: Category Manager

'I like the team to do a bottom-up plan and sense check it against a top-line category growth.'

'*We'll have the SCO list for the season based on all the insight and review and we'll do a category projection at that point. The Product Managers will do a projection for volume based on the volume picture from the previous comparable season from the year before. There is more stability in this particular category range from one season to the next.*'

Foot-One: Review Meeting

'*I think this is really exciting. I think this is the key thing for us to get right. We also need to let the Sales guys know the sales history success we've had with these types of product.*'

Foot-Two: Review Meeting

'*With this style we have a potential of 16,000 pairs. It's not an unrealistic number.*'

External Sport Brand B: Merchandiser and Key Account Manager

'*We did loads of forecasting. You'd forecast out of your mind. At least three; short, mid and long range forecasts. Short range would be from initial design review. Once the line was adopted and confirmed, the Category Sales Manager would put in a bottom-up forecast.*

From the CADs being presented, we would forecast. They [USA Global Design]

would drop anything which all the markets had not forecasted on. So that would be the first forecast. Once any tweaks had been made and we'd got to colour level we'd give a second forecast. Just before we would hand-off and present to Sales at Launch, we'd give a final forecast. And then we'd hand over to Sales. The Sales guys would forecast after that. There would be a bottom-up forecast from Account Management level, where we'd forecast by line and by colour. That would feed into the Category Forecast which in turn would feed into the Country forecast.

It took about 3 months from CADs to the Account Management bottom-up forecast.'

External Sport Brand C: Designer

'*We had 3 reviews during the process, 50% review, 70% and 100%. Even at the first review we had everybody there. We treated the 50% meeting the same as the 100% meeting. Forecast volumes were reviewed each time. At 100% you would have all your salesman's samples in, catwalk show, photo-shoots. Even then you could have a change. And then you would have "go-live". They would call it a 360, where even the Designers don't turn up. It's Product Line Managers that discuss with the Sales Teams.*'

5.2.1.2.3.2 STRATEGIC FIT CHECK

In the review meetings there was also evidence of strategic "sense" and "fit" checks (Saunders et al., 2005), predominantly at the product level. This is a team check of product strategic alignment. This was an important aspect of the process. Management assess whether the different strategic and seasonal needs and demands required from the portfolio were being met by the products under review. These different demand perspectives of the NPD portfolio and products were expressed by the different management functions represented in the meeting; Design, Sales, Development, Supply Chain, Sourcing and Finance. Most contributions in the meeting, on these requirements, came from Sales and Design. Also, Sourcing and Supply Chain management often had important input. The different functional needs and requirements were stated or challenged:

Fashion-Three: Head of Sales

'*First of all, is the product "on brand", fit with the brand, with what the brand represents and what we're doing. Then I would look and think about the customer and the commerciality of the product. Again, does it fit in with our "go to market" strategy? Which customers will that suit? How commercial is it, how many units will*

we sell? And thirdly, I think it's more sort of balance of the range. Is the style represented elsewhere within the range? Can it get thrown out? Does it double-up, is it doing the same job?'

Sport-One: Category Manager

'*When they build up volume at a line level they will look at current performance and over the previous three seasons, number of SCOs in the range, volume sales, gross margin and then we'll start to look at the winners and losers, take out discontinuations, see if there are any gaps in the range, competitor landscaping. What's working for us that we can develop more*.'

Walk-One Review Meeting: Finance Director

'*With the forecast we need to be realistic.*'

Walk-One Review Meeting:

'*Do you think the forecast* [on that product] *is still a 1,000* [units]*?*'

'*We need a check with key stakeholders on the volume forecasts of the bottom three products.*'

'*The overall category forecast is growing.*'

'*There's not a cat-in-hells chance of selling it at €220.*'

'*It looks great but feels more like 500 units not 950.*'

'*The worry about two jackets at the same price point, on what numbers we will hit. Do we have indications from all markets what volumes? '*

'*This is where you've got to be very sure that your forecast is robust.*'

'*We've only got a forecast of 900 units against it, the hip shape isn't working.*'

Fashion-Three Review Meeting:

'*In all the sales reports I've seen there's no reason why we should drop it.*'

'*That should go. We haven't done any volume in them. They are not interesting shoes*'

'*We did 1,200 pairs last season. We now have six colours. I suggest we only need two colours.*'

Foot-One: Review Meeting

'*By embossing on the toe will give it much better shelf appeal*'

'*There are no concerns for supply chain there. It looks well managed. It really fits in with the sourcing plans.*'

'*You need to be very careful on the pricing. You can pitch above €50, it may be*

difficult. What you're proposing may be too high. Let's change the price to €50, that's the benchmark price. €50 is a really important price point for us. There is nothing on the line list at €50. We need to target the canvas slip-on at €50.'

'*It looks like we will do 10-15,000 pairs for Spring Summer and another 20,000 pairs for Autumn Winter. We need to help the factory with the downtime in-between.*'

External Sport Brand C: Designer

'*In the pack there was creative direction; colours, fabrics, branding. That would then be digested by the Product Line Manager and us. The PLM would create a range plan and hand this over to the Designers. There was also information about what countries were selling what colours and what types of garments, because you're designing for a global audience. What's right in the European market is not right for the Far East. The pack would have the number of styles required and the colours and the number of seasonal delivery drops.*'

This progression into product level forecasting, carried out at multiple stage-gate points in the NPD cycle, with commercial and functional strategic "fit" checks represents a further sophistication in the application of FAC. This higher level of FAC can be labelled as "Product level forecasting through the NPD process with a Strategic Fit check" (Figure 25).

Figure 25 FAC SOPHISTICATION FRAMEWORK

Inductive Development – Step 4

High Level of FAC

Review of targets and target metrics

Scenario planning

Level 3	**Product level forecasting through the NPD process + Strategic Fit Check**
Level 2	Product Category level forecasting (anticipated outcome) and Target Setting Volume/Revenue/Margin
Level 1	Actuals reporting (feedback measures) Volume/Revenue/Margin
Level 0	No Measurement

Low Level of FAC

5.2.1.3 Scenario Planning

The initial FAC framework development (Figure 18) places scenario planning at a higher FAC level than" Forecasting". Compared to the lower levels of FAC sophistication there was much less data obtained on scenario planning. Given the higher level of FAC sophistication this could be expected. However, in the findings it is also clear that not one of the studied brands uses any form of structured approach to scenario planning. There were no findings on scenario planning from the external brand interviews.

Guidance on the sorts of evidence that would be observed from a more structured approach was described in the systematic literature review FAC operationalization results; weighing alternative courses of action (Miller & Friesen, 1982; Karlsson and Åhlström, 1997), answering what-if questions (Makridakis, 1986) and mechanisms for evaluating trade-offs among NPD projects (Bisbe & Malagueno, 2009). Such tools would be based on product level forecasts. The findings only demonstrate these activities at a basic level, mostly single product evaluation, and not at a consolidated category or range perspective.

The literature review results also operationalize scenario planning as a forecasting review, evaluating plan prior to performance (Ishikawa & Smith, 1972; Radosevich, 1977). Again, there were no findings that could be described by this activity. However, this should form part of the activity at this FAC level.

The findings describe risk evaluations of product, the team inability to plan in flexibility, assessing incremental volume opportunities, and managing product category risks.

Fashion-Three: Managing Director

'The financial risk of taking the style out compared to the risk of not moving on, it came to that tipping point. We've had that conversation in the previous season's review and we didn't feel that we were there. We're now feel six months on that there's enough activity out there and enough information that allows you to make that decision. Plus you've got the next one to take that business.'

Walk-One: Focus Group

'*There is not enough up-stream planning. We do not plan enough flexibility in the margin and cash margin build.*'

Walk-One: Category Manager Lisa R

'*In my head I do best case/worst case, "if this happens, this could lead onto another product category".* '

Fashion-Three: Managing Director

'*In our business we have a fairly instinctive view on what's next, what's the next big thing and how we're going to get there. At the moment we don't have the thought of what that means by category, what's that figure.*'

Sport-Two: Review Meeting

'Can we make this more premium for the later season development, so that we don't lose the pairage completely.'

'*We did 62,000 pairs with four SCOs in Q3. So anything we add in here will be good. We've got some work to do here but there is serious volume*.'

Foot-One: Review Meeting

'*We should develop these, even just in case we need a back-up*.'

'*Let's check the numbers on casual adult strap, just to see if we need to do it. We've had a couple of good strap products and it would be good to keep one in.*'

'*I think we're OK. It'll be good for back-up in case we need kids stitch-down capacity.*'

'*Maybe this is something we can do in suede for Spring and leather for Autumn.*'

Foot-Two: Review Meeting

'*We sold 2,000 last year but we were out of stock for a while. Is there incremental business we can get here by adding some SKUs?*'

'*I think we're really getting somewhere here. It's all on brand. We've got three silhouettes that work. The investment in SCOs here could give you some incremental volume and is much less risky than investing in multi-active. If it becomes core we need to move production to China.*'

The progression into scenario planning represents further sophistication in the application of FAC, when compared to product level forecasting. The lack of data and brand structured approaches in the findings, at this FAC level, also presents an intervention opportunity for all the studied brands if advanced into the planned action research study. This higher level of FAC can be labelled as “Scenario planning / Forecast review: Product level forecast volume / revenue / margin” (Figure 26).

Figure 26 FAC SOPHISTICATION FRAMEWORK
Inductive Development – Step 5

High Level of FAC

Review of targets and target metrics

Level 4	**Scenario planning / Forecast review: Product level forecast** **Volume/Revenue/Margin**
Level 3	Product level forecasting through the NPD process + Strategic Fit Check
Level 2	Product Category level forecasting (anticipated outcome) and Target Setting Volume/Revenue/Margin
Level 1	Actuals reporting (feedback measures) Volume/Revenue/Margin
Level 0	No Measurement

Low Level of FAC

5.2.1.4 Review of Targets and Double-loop Learning

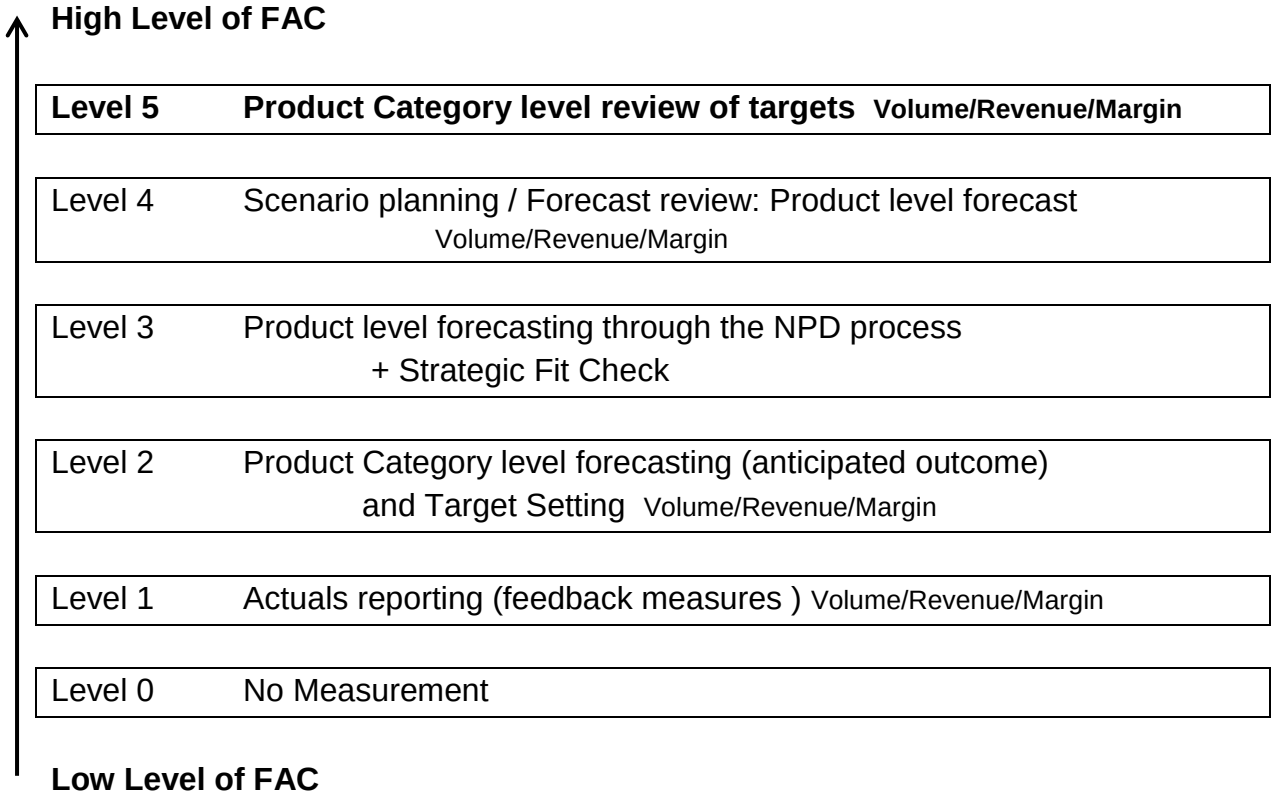
The development of the initial FAC Framework (Figure 18) suggests that a validity review of targets, represents the highest level of FAC and would not be done until completion of scenario planning. The questioning of goals and targets and a review of their validity is the key characteristic of double-loop learning (Argyris, 1976, 1977). The system dynamics work of Senge and Fulmer (1993), where the authors claim

that ‘anticipatory learning focuses on what is likely or possible for the future’, is also centred on double-loop learning.

There were no findings captured that represent this highest level of FAC sophistication. Given the lack of any structured approach to scenario planning from the studied brands, at the previous lower level of FAC sophistication, this result is not unexpected. However, the empirical findings in the “forecasting” results suggest that the key review level for targets is at Product Category level and not at the highest level of “Total Portfolio”, nor at the lowest “Product” level. Refining the initial FAC framework level description, this FAC level can be labelled “Product Category level review of targets volume / revenue / margin” (Figure 27).

Also the review of Product Category targets, after carrying out scenario planning, could provide possible FAC level intervention work with some of the brands, planned for Project 3.

Figure 27 FAC SOPHISTICATION FRAMEWORK
Inductive Development – Step 6



The initial framework high level FAC concept of “target metrics review” is covered in the next section on findings of the “FAC metric”.

5.2.1.5 FAC Metric

The performance measures used in range building were described in Project 1. A key measure is SCO productivity, which can be measured as unit volumes of sale per product or cash profit per product. The empirical results show that the product productivity measure seems to have an important relationship with the application of FAC. This relationship is observed in findings from Sport-Two, one of the largest brands in the study. Sport-Two appears to be using the highest empirically observed level of FAC sophistication compared to all the other brands in the study. The brand uses product level forecasting through the NPD process (Level 3) and also sets product productivity targets.

In Sport-Two, the reporting of product productivity actuals and notably the setting of targets is used to drive NPD portfolio performance management and is considered a core concept in the value proposition. Having a single metric playing a crucial role linking FAC to performance was not an expected result, especially since it was not found in the systematic literature review results in Project 1. A key characteristic of the measure is that it is a productivity ratio.

Gareth H – Sport-Two Product Director

‘*I set SCO productivity targets* [pairs per SCO]*, including below overall category level e.g. at gender level.*’

‘*On balance it is better to raise design resource and effort on a focused range, rather than design many products, diluting focus, to pick up low volume sales.*’

‘*When I took over the SW category two years ago I had four key objectives. One of these key objectives was to improve SKU efficiency in both genders. Mens was achieving 1,940 pairs per SKU and womens 800 pairs per SKU. I set targets of achieving 3,000 pairs per SKU on mens and 2,400 pairs per SKU on womens.*’

Sport-Two currently has five product categories, of which two categories represent the bulk of the business. One of these major categories, Category SW, has had the

following year-on-year performance change, as presented in Table 8, where Year-2 (is two years prior), Year-1 (is the prior year) and Year0 is the current year:

Table 8 Sport-Two Category Performance

	Yr-1 vs Yr-2	Yr0 vs Yr-1
Volume (pairage) change %	+28%	+44%

SCO productivity:

Volume per SCO	Year -2	Year-1	Year 0	Yr 0 vs Yr-2
Mens	1,940	4,400	4,820	248%
Womens	800	3,120	3,950	494%

These retrospective results show that the Sport-Two Product Director exceeded the planned product productivity targets in Year-1 and simultaneously achieved significant overall category volume growth over the past two consecutive years.

These findings, from retrospective data, are significant in that they provide support to the knowledge development at the core of this research study, that the application of higher levels of FAC sophistication influences performance improvement in product portfolios managed through stage-gate NPD. These results also highlight the types of “hard” performance metrics that will need to be captured in a longitudinal action research study.

The application and effect of this metric appears to be beyond ‘interactive’ control (Simons, 1994, 1995). Management recognises that it is a key ratio that has to be managed and it is a decision-making “shaping” measure that management are trying to improve. It can be applied in both feedforward and feedback loops, in the capture of actual performance and reviewing forecast outcomes and setting targets and goals.

It is a highly practical measure that gets people to think about what they are doing and appears to challenge people in a different but meaningful way. These findings from the Sport-Two Product Director and observations from the Sport-Two review meetings suggest that the setting of targets on this measure has the capability to guide decision challenges in control versus creativity (Peters and Waterman, 1982

p318; Cowen and Middaugh, 1998; Simons, 1994; Bisbe and Otley, 2004; Frow et al., 2005; Morris et al., 2006; Wynder, 2007; Richtnér and Åhlström, 2010).

It also positions the metric in the FAC operationalization label identified in the systematic literature review of “evaluation and screening criteria” (Rice et al., 1998). This FAC operationalization is described as stage-gate “should meet” criteria (Cooper et al., 2002), assisting in portfolio management solutions that evaluate, rank, prioritize and focus on fewer but better NPD projects (Cooper & Edgett, 2003), with tough rigorous gates with robust and visible go/kill criteria (Cooper & Edgett, 2003), that “filter” excessive NPD (Bisbe & Otley, 2004) and use feedback and feedforward control (Jørgensen & Messner, 2009).

The identification of this metric is a key finding of the project and is given the label “FAC metric” to signify its importance.

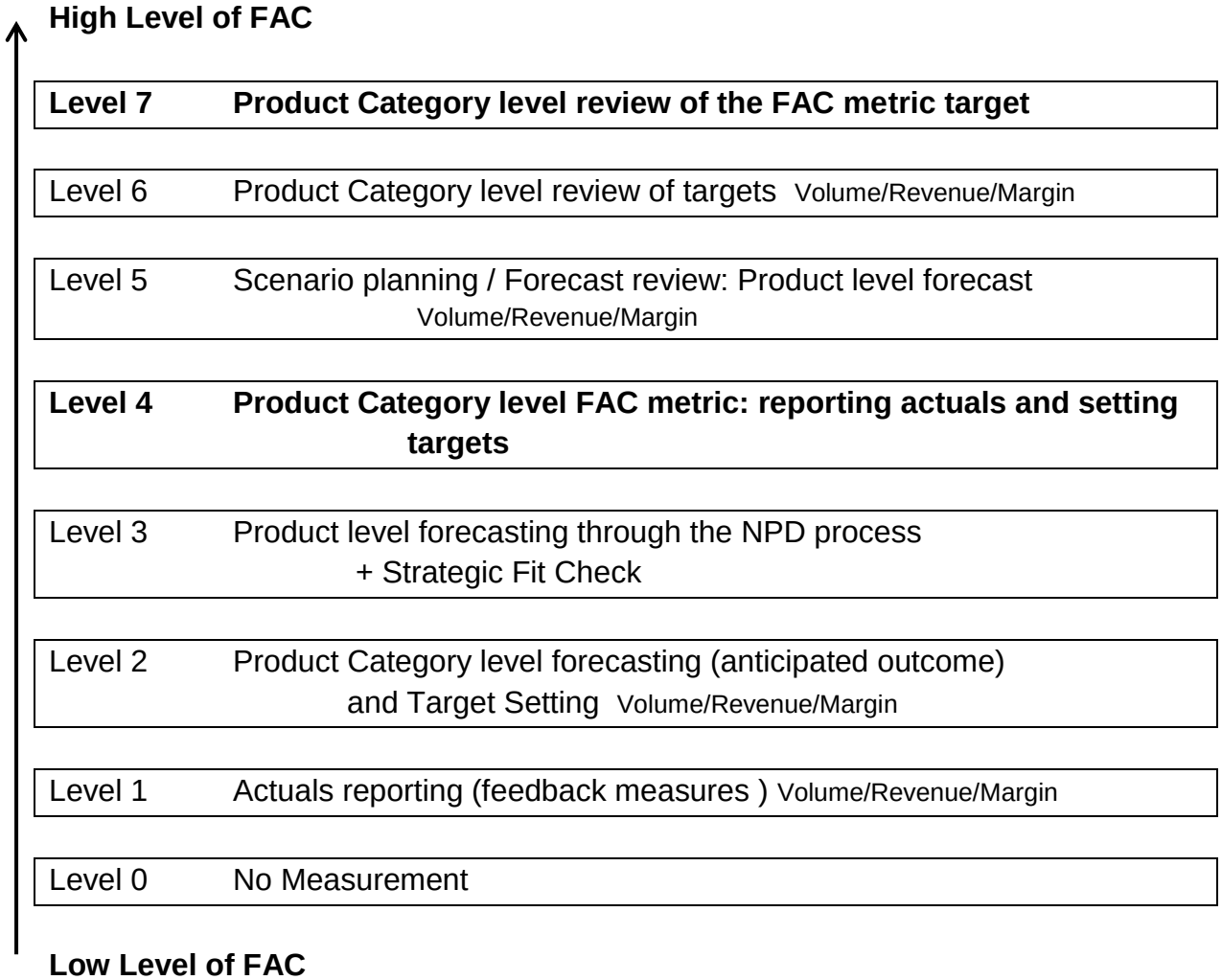
From the Sport-Two empirical findings the metric is applied to Category level forecasts but is also used as a “threshold” or boundary screening measure (Simons, 1994; Micheli and Manzoni, 2010) when evaluating single products. This evaluation assesses whether the product will enhance or deteriorate the anticipated performance of the FAC metric.

Therefore the reporting and setting of the FAC metric occurs at a higher FAC sophistication level than “Product level forecasting”. The empirical findings also show that the FAC metric target can be set and deliver improvements without a structured approach to scenario planning. The conclusion being, that if a brand has already set targets and reports actual performance of the FAC metric, the next higher FAC sophistication step of scenario planning would further enhance portfolio performance. Therefore the empirical findings place, what can be labelled “Product Category Level FAC metric: reporting actuals and setting targets”, above “Product level forecasting” and below “Scenario Planning” (Figure 28).

Applying the rationale considered in the section on double-loop learning, this also places the product category level review of the FAC metric target above the “Product Category level review of targets” in the hierarchy of FAC sophistication levels. Therefore “Product Category level review of the FAC metric target” represents the highest level of FAC sophistication in the FAC Framework (Figure 28).

Figure 28 FAC SOPHISTICATION FRAMEWORK

Inductive Development – Step 7



5.2.1.6 Completing the FAC Framework

The results have helped both validate and refine the development of the FAC Framework. The different identified levels of increasing FAC sophistication can be labelled “Sophistication Level” numbers (Figure 29).

The empirical findings also demonstrate that each higher level of sophistication is built on the application and learning from the lower levels of FAC sophistication. Attempts to operate at higher levels of FAC can be done but are unlikely to be fully effective unless consolidation of application has been achieved in the FAC levels building up to the targeted higher level. This is an important area for the planned action research study.

Figure 29

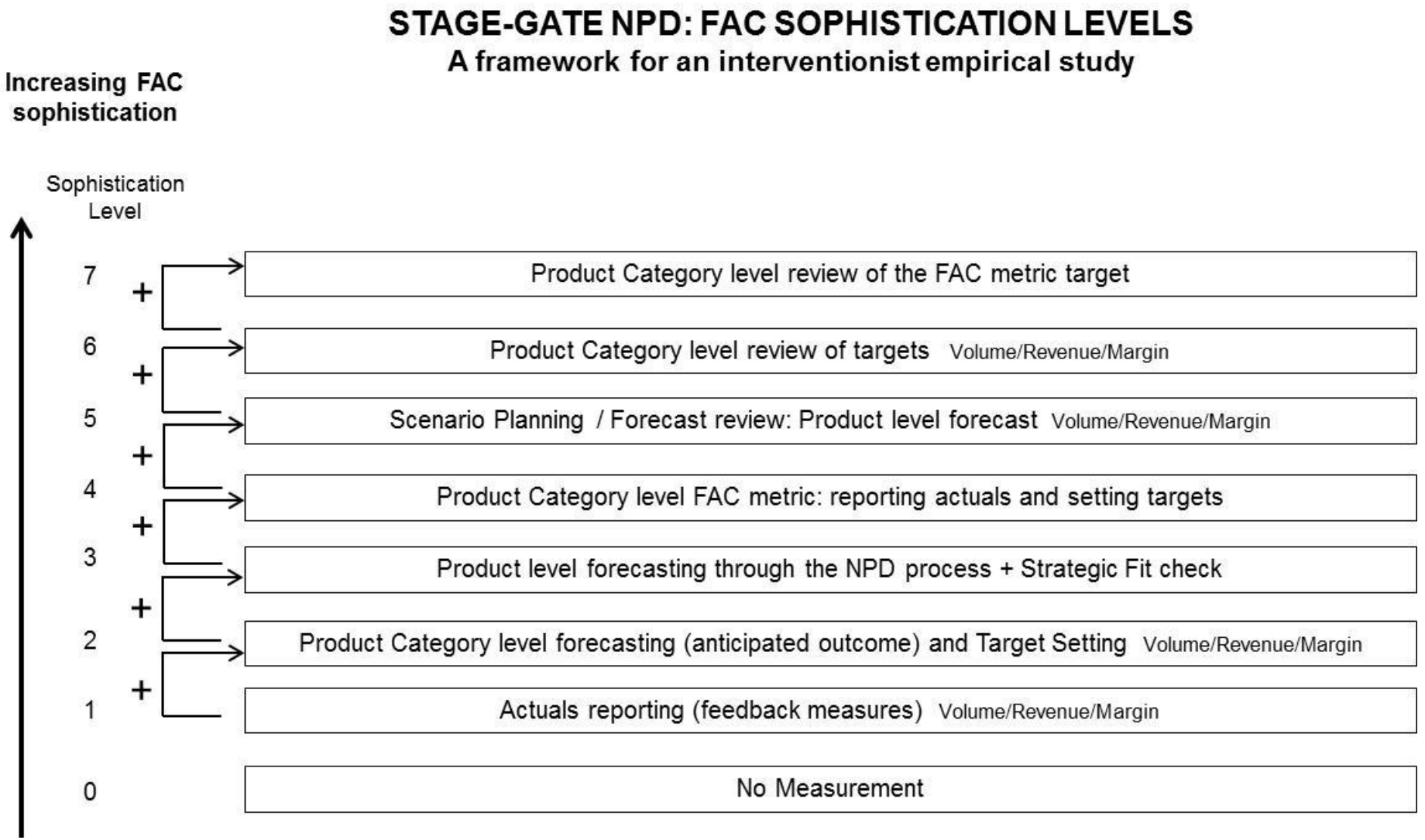
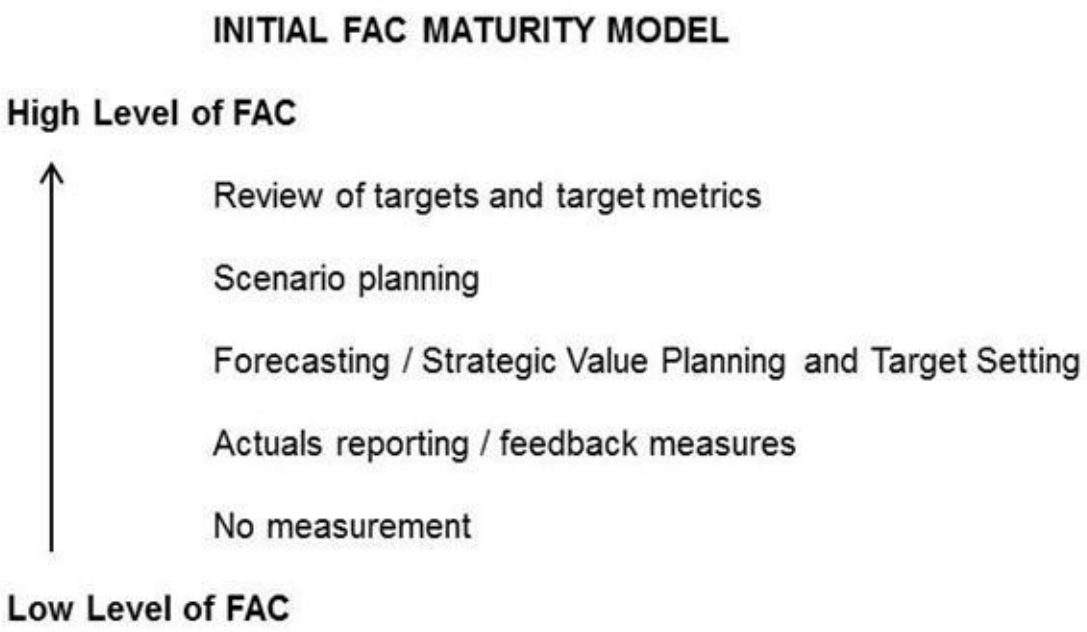

STAGE-GATE NPD: FAC SOPHISTICATION LEVELS
A framework for an interventionist empirical study
Increasing FAC sophistication
Sophistication Level
7
6
5
4
3
2
1
0
+
Product Category level review of the FAC metric target
Product Category level review of targets Volume/Revenue/Margin
Scenario Planning / Forecast review: Product level forecast Volume/Revenue/Margin
Product Category level FAC metric: reporting actuals and setting targets
Product level forecasting through the NPD process + Strategic Fit check
Product Category level forecasting (anticipated outcome) and Target Setting Volume/Revenue/Margin
Actuals reporting (feedback measures) Volume/Revenue/Margin
No Measurement

Figure 30 Comparison of the Initial Deductively Developed FAC Framework and the Final Inductively Refined FAC Framework



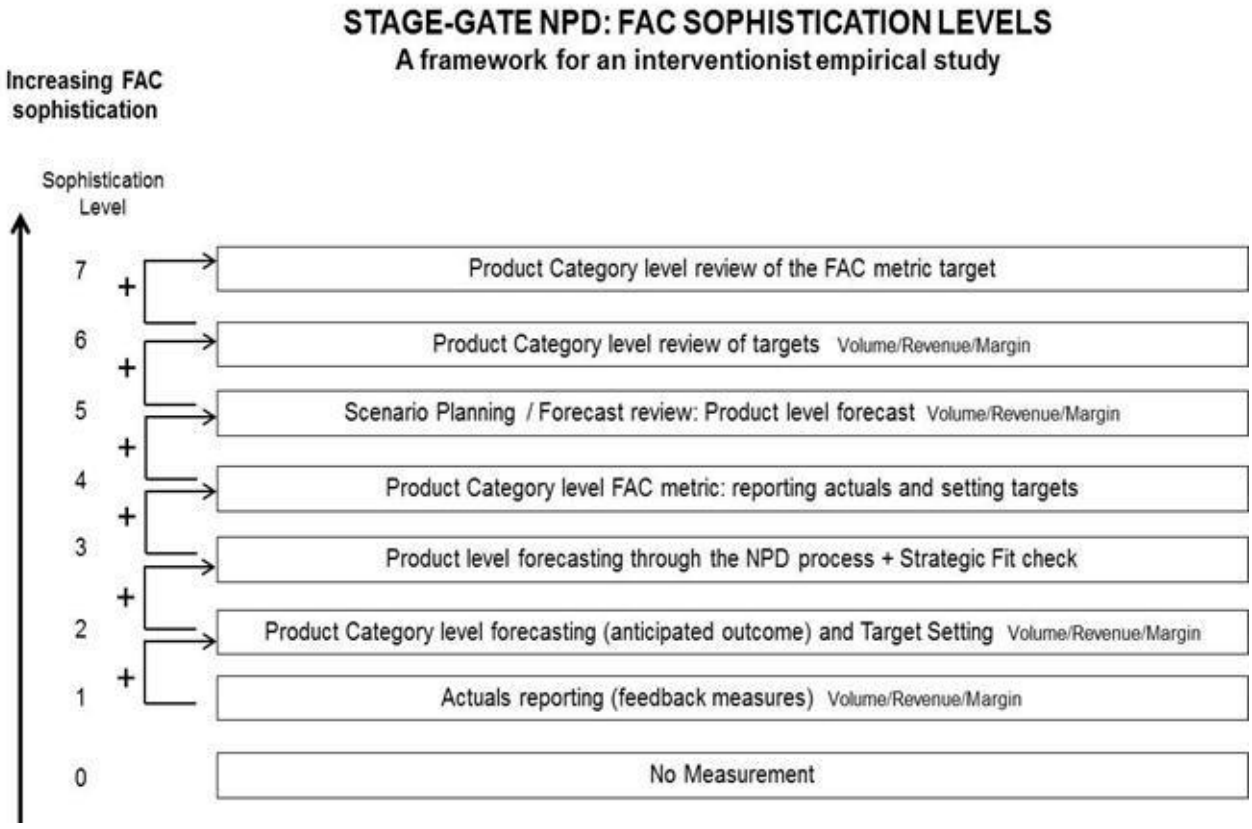


Figure 30 compares the initial deductively developed framework (Figure 18) with the final framework developed from empirically derived inductive refinement (Figure 29).

This finding is demonstrated in the FAC Framework, presented in Figure 29, by showing upward moving arrows and “+” signs to signify the consolidation of the lower levels of FAC sophistication in achieving a higher level of FAC sophistication.

5.3 The Portfolio Performance Framework

I now turn to the second framework. The purpose of this second framework, for use in the planned action research study, is to be able to observe, capture and assess changes in NPD portfolio performance, post intervention (Figure 19). It is important that this framework is developed from empirical data, clarifying how management measure performance, both in “hard” metrics and in “softer” perception measures. The importance is in the dual requirement of first having a framework for intervention study (Eden and Huxham, 2002; Miles and Huberman, 1994, p280; Cook and Campbell, 1979) and secondly a framework that is able to capture the actual measure of performance from empirical data collection during Project 3. These are measures identified from the data and findings that can represent key questions or provide guidance for a protocol for capturing NPD portfolio performance data.

As described in the methodology section, to identify the concepts of performance from the data an open coding analysis was carried out (Strauss and Corbin, 1998), with labelling of the features of performance (Appendix N), followed by categorization development (Appendix O) and finally classification of measurable sub-categorization dimensions of performance.

Seven categorizations of performance are identified; Range Structure Performance, Design Performance, Price Architecture Performance, Objective Informed Decision-Making, Up-front Planning Performance, Cross-functional Alignment and Metrics.

Within these categorizations, twenty-two sub-categorizations are identified (Figure 31). The categorizations and their sub-categorizations of performance are presented with supporting data, from all three methodologies applied.

5.3.1 Range Structure Performance

A high performing range structure is demonstrated by the role of each product in the range being justified and avoiding unnecessary complexity in the range build, a clear understanding of where any product overdevelopment is planned, the avoidance of

two or more products “doing the same job” and the achievement of minimum order quantities (MOQs) on all launched products.

The role of each SCO role is justified and there is no unnecessary complexity

In this range structure performance sub-categorization the measure of performance is that every product is seen as having a purpose and a “role” in the range. The result is a focused and “tight” range with the avoidance of unnecessary complexity in the product range build.

Fashion-One: Managing Director

‘*Keeping it tight for very good reasons, every SCO has to have its place justified in the market*.’

‘ *“Throwing too much at the wall” and asking for favours from vendors; too much reliance on vendor goodwill, lose flexibility*.’

Foot-One: Category Manager

‘*I use a template to eliminate the risk of duplication and ensure each SCO earns its place*.’

Walk-One: Category Manager Lisa R

‘*It feels like a sweetie shop at the moment and it isn’t*.’

Sport-Two: Product Director

‘*We have a problem with Sales offering too many small volume products, I want to focus on doing better products.*’

Sport-Two: Business Analyst

‘*It’s not letting them have free reign and saying I’m going to design a shoe and not think about how many people might be interested in it, “I’m just going to design a shoe”, go out there and design one. It’s the very first seed that’s planted in their head isn’t about the shoe, it’s about what I’m trying to achieve with the shoe. You know what you’re doing before you start planning the range*.’

‘*For me the biggest concern of all would be trying to get the target pairage by just throwing as much as you can and hoping loads of it hits, because you’re not going to make any money on that. But by having targets you’re setting boundaries already. You won’t be able to have more than this number of shoes in a range. At the range planning meeting you’re saying “well, what are those shoes adding*”.’

Sport-Two: e-Commerce Team

'*What we did learn from the first time around was that we used to buy too many colour options per style. And we massively dropped that. We used to think, "that's a great shoe, let's buy in all the colours"*.'

Sport-One: Focus Group

'*We are not as good at saying what we shouldn't do. This drives unnecessary complexity*.'

'*The range is too large, large duplication*.'

Sport-One: Category Manager

'*Probably up to a year ago, in our key categories, we were changing over 80% of the range, every season. You can imagine the complexity, the development process, the design time, the complexity for our partners. All that our partners would be doing with that range is selling the 80% newness every season, not thinking about how do we optimize in store, and through joint business planning. It's trying to take the emphasis away from churning out lots and lots of new product. You can change a product that might add 3% to the sales but is it worth the effort and the complexity to do that versus "what are the big new opportunities", how do we build really strong propositions that might drive 30% growth*.'

Any overdevelopment is understood and managed

It is seen as poor range structure performance when products are designed and developed that should not be in the range or will not end up being launched into the market. However, overdevelopment appears linked to market uncertainty, and therefore overdevelopment has a role if it is managed and its purpose is clearly understood.

Walk-One: Category Manager Mike C

'*It's about creating greater focus and putting less product out there, you get there by reducing the number of styles and SCOs. Tools that stop overdevelopment and stops you doing stuff that you shouldn't*.'

Fashion-Three: Managing Director

'*If you go back four years there was a Design team and Manager who were building the range. As well as driving some correct decisions on product, you don't know*

what you're missing. You also haven't got discipline around the range size and format so you're probably not maximising the financial opportunity from that range because you've got too much development or you've got too many products in the range.'

'*Which first of all means we've got too many out on the table. Too many to start off with. But secondly a change in mindset around knowing where we needed to be and within the whole team an acceptance of the fact that it drives performance rather than restricting it*.'

'*We want to drive our Casual business, what does that mean from a SCO count? Actually what we're saying is we have an overall SCO count at this level and therefore Casual is probably going to take a bigger percentage of it but we haven't really narrowed those decisions down*.'

Fashion-Three: Head of Supply Chain

'*We set almost like a context and an agenda and we also have an ideal SCO count that goes in when we're managing*.'

Duplication, cannibalization and divided sales are avoided

The role of each SCO may be justified but this sub-categorization identifies that the range may still be underperforming if any two or more SCOs are "doing the same job", that is a duplication of roles and dividing sales.

Walk-One: Merchandising Manager

'*We're looking for evidence. Is this duplication? We want to avoid cannibalization. Looking for opportunities for rationalization. I know I can wipe out a third of the range with no problem, no overall effect on sales performance*.'

'*How are we going to deliver the growth? More focus. Stop the scatter gun approach*.'

Sport-Two: e-Commerce Team

'*The analysis I did on the data showed that you were just splitting your sales across the others*.'

Fashion-Three: Design Manager

'*When we're sat in that meeting, it's much easier for me to look at it if I've got three*

styles, it's much easier to drop two out when you can clearly see the one that's supposed to be doing the job. I would never have seriously considered that we wanted three styles doing that job, even though we've developed three styles. That's why the designer is not offended that two have gone because all along it was only ever going to be one style. There is some cost to doing it, transport, time, so there is some wasted cost in there but I think sometimes I would rather see how things evolve.'

MOQs are achieved

A basic sub-categorization of range structure performance is that all the products launched into the market achieve sales order volumes that equal or exceed the minimum purchase order quantities as dictated by the third party factory vendors. If these MOQs are not achieved the third party factory can turn down the brand production order or charge a large premium to complete the purchase order. This can result in the brand having to withdraw the product from the range and cancel the sales orders with customers. Therefore the achievement of MOQs is seen as an important range structure performance measure.

Sport-Two: e-Commerce Team

'*300 is quite an arbitrary figure. I mean that is the point. Should it be 250 or 220? Should it be 190 or 400? We know it shouldn't be 400 because part of the problem we have is the manufacturing minima. It's becoming a smaller issue as we get bigger but it is still an issue for us*.'

Fashion-Three: Head of Sales

'*Because what it comes down to again is if it's not going to hit minimums why is it ever going to be in the collection? Is it just a distraction? All it's going to do is sort of divide sales. In the Sales team we are now looking around that sort of efficiency, trying to drive as much sales, not into a core, into a core collection but really trying to make sure that we have as little fallout as possible. Because, that is, from a salesman's point of view the worst thing you can ever see, product not making it to your retailer because it hasn't reached minimums*.'

These sub-categorization findings of SCO role justification, managing overdevelopment, avoiding duplication and achieving MOQs, were well represented in both the observed review meetings and the focus groups:

Walk-One: Focus Group

'*There are challenges to hit MOQs*.'

'*We have too many styles, we don't do fewer styles that we could love more*.'

'*There is overlap between category ranges*.'

'*There are challenges on SCO count and colour, greater colour stories are not achieved*.'

'*We're not getting enough focus or clarity on some key categories*.'

Walk-One: Review Meeting

'*Some products are doing other jobs. There is no point in keeping all those three styles. We need to discuss this with Sales*.'

'*I'm concerned about cannibalization*.'

'*The worst case would be to spread the sales and don't have weight behind either*.'

Fashion-Three: Review Meeting

'*No-one is going to buy two desert boots from us. One with a buckle and one without*.'

'*I don't think we should have two fashion wedges groups that do the same job. It will split volume*.'

Fashion-Two: Focus Group

'*The size of the range is overly large*.'

Sport-Two: Review Meeting

'*How many SCOs do we need? Let's look at the stronger colours to reduce the number of SCOs here*.'

'*Two colours look as though they're doing the same job, pink and coral. Which do you think is the stronger?*'

'*Four killed, that will help us with our MOQs*.'

Foot-One: Review Meeting

'*Rather than open a new kit for this we can start by experimenting on this existing unit.*'

'*I need to cut-out options but I'd like to get to the next range review stage first.*'

'*It's really tight. It's a great achievement to get all that product into such a tight range. Also, we only need a new sole plate on the one existing kit. So there's not a lot of money we're having to shelve out to make this collection. There's a great use*

of existing kits.'

'*Last summer all three were really strong. But we need to change these two out of the new three because they are doing the same job.*'

'*We still need to keep our breadth of offers but we need to take out 20 options on the wall. It'll have to be colours. We've got a big challenge on our hands because we've got to reduce the numbers. We should boot out the weakest colours.*'

'*We've looked at this thoroughly, the best sellers and colours and we've made sure that there isn't anything fighting each other.*'

'*There are 370 pairs of the black option on the order book at the moment. The minimum is 600 pairs.*'

Foot-Two: Review Meeting

'*We are putting in a fabric option because the consumer is different than the one buying leather. If it was the same consumer we shouldn't do it because we are damaging ourselves.*'

5.3.2 Design Performance

High performing design is demonstrated in the NPD portfolio by a strong performing product "core" with new products brought in effectively, as and when required. Also, when the core itself is "tired", it can be effectively replaced. Good design performance also occurs with recognition of new product categories and trends that gain adequate representation in the NPD portfolio.

A performing 'core' with newness brought in

Management see it as essential that there is a "performing core" of products within the portfolio and that NPD is brought in effectively, so that the performing core is maintained.

Fashion-Three: Head of Sales

'*In this last range review there was a lot of newness going to market. That is one of the strategies that we've put in place now. We're quite highly dependent on probably three or four styles that we've had in the range for the past eighteen months to two years and still selling through great at retail. But we want to find those next core and we're never going to do that without getting that newness to market*.'

Sport-One: Category Manager

'*Across the whole range we are looking for a bigger core / steady-state and then newness, NPD in the range*.'

'*In the category we've got a good core, 80% of the business, that we can manage, that we can look to optimize, we can look at pricing, packaging, messaging etc. But it's also easier for us to forecast and plan that and then time to look at the really new parts of the range we want to add*.'

'*We start to understand the priorities for the season, what the leadership team want us to focus on, and to help inform about how we should shape the range. The levels of newness versus steady state*.'

Fashion-Two: Group Interview

'*I think in more recent times, we've started to address much better the carryover process*.'

Foot-Two: Review Meeting

'*We've done nothing with "country walking". It's been going for over 15 years. Is there something incremental from a business viewpoint. It'll be a small tight range*.'

Core product is replaced when required

Management also note that the "core product" has a lifecycle, with limitations on life expectancy. The product core will eventually tire in the market-place. Good design performance is seen to recognize this lifecycle development in a timely manner and effectively replace the old core product when this occurs. The findings appear to affect the fashion brands more than the sports or outdoor brands. The fashion brands have to manage faster changes in trends within their product ranges.

Sport-One: Category Manager

'*It's a full and deep review of the existing range before we decide what we want to do with it. We're looking at the tail of the range, taking out what's not working, understanding the implications of that for what we leave in the range, capturing gaps. And planning into that line level detail, that line list where the newness should be. And whether it's about building on existing winners, so if it's a "family" of product that's working, why is it working, what markets, what can we do with that family if we think it's a success?*'

Fashion-Three: Managing Director

'*We're all sitting there knowing that the right decision is to move on, it's just about timing and have we got the right product to succeed it. It's like in everything, you've got to have succession planning, it's similar with product*.'

Fashion-Three: Design Manager

'*That's clearly cooled off for me. That was no decision, that wasn't a difficult decision to make. It's a big seller that's cooling off and we haven't yet established its replacement*.'

Fashion-Three: Review Meeting

'*There's a lot of nervousness dropping such a big seller*.'

Foot-Two: Review Meeting

'*Commercially, from where we want to go does that do the job? It looks a really good story. We can get market share. The trade are asking "what are you doing?", "what are you changing?". We can regain where we were in the past. It gives the buyer a reason to trial it.*'

Range recognises new categories and trends

As trends in the market develop a brand may find that there is a gap in their product range because this market development is not being addressed. High design performance establishes product within the portfolio that potentially meets this new demand. The findings show the importance of recognizing and responding to new trends and not "missing anything important".

Fashion-Three: Head of Sales

'*We ask customers the obvious questions, what's doing well for other brands, what trends are they seeing coming through, are there any sort of surprises?*'

Fashion-Three: Design Manager

'*That's just trend information. What I would say as well is that there is an element of recognising patterns*.'

'*It could be whole new categories that are coming through. So, for instance, two or*

three seasons ago we recognised that casual shoes were gradually starting to build and build.'

Fashion-Two: Group Interview
'*We can so easily miss something important*.'

Sport-One: Focus Group
'*We can create trends*.'

Sport-Two: e-Commerce
'*We speak to the wholesale Sales manager because he has a group of "cool" customers. We can check with him whether colours are right for next season. He's thinking "what is the look" for next season*.'
'*Looking at blogs, emails, competitors. What trends they are communicating about or emphasising for the next season*.'
'*It comes back to missed opportunities and we don't want to repeat the mistake of womens sandals. It will happen again, on something*.'

'*The only thing I can think of is something like a trend forecaster. Maybe to give us more confidence in what we're buying*.'

Fashion-Three: Review Meeting
'*The duck boot is bang on trend and our key customer has requested it*.'

Fashion-Two: Focus Group
'*We are good at setting trends and being unique on styles*.'
'*We know the strength products*.'

Foot-Two: Review Meeting
'*Multi-active trail is "white space" for us, it's something we've not tackled. Our positioning will give us a point of difference. It's clearly a big opportunity for us. This is a market we could play in.*'
'*This sock range will be purely incremental for the brand. This is a totally new opportunity.*'

Similar design performance results were obtained from the external brands findings:

External Fashion Brand A: Sourcing Director

'*We were also very reactionary, design led, "We are the brand, we know what we're doing". That often led to SMUs being added in at a later stage because things were missing from the range.*'

External Sport Brand B: Merchandiser and Key Account Manager

'*It's also about the product lifecycle. You don't want to chop something too early that's still got a lot of life in it. What's new, what's about to drop off? Has it peaked? How long has it been in the marketplace? How much longer does it have in the marketplace? In Sport Brand B we would take 12 to 24 months to build into a shoe. You have to realise that things take time.*'

'*Where's the heat coming from in your assortment, where's the newness, where's the excitement, where's the brand heat.*'

5.3.3 Price Architecture Performance

A critical performance categorization is on pricing, with the knowledge and management of product prices across the range, where there is an effective "price architecture" or "price curve". Overall performance is also seen to have dependence on a good understanding of product price elasticity, where the volume impact of any changes in market pricing is understood.

Right price points, architecture and price curve

Good price architecture performance is achieved when the customer and consumer "see value" in the product, when there are no "unexplained gaps" in the product pricing curve and overall pricing is "pitched" commercially and competitively across the range. For many of the studied brands this stretches from "entry level up to premium" pricing.

Fashion-One: Managing Director

'*Get designers and product developers designing to a price point. "Tailoring" the fabric sourcing – "designing to a price and a cost".*'

Foot-One: Category Manager

'*A clearer pricing architecture, to make sure the customer sees value*.'

Walk-One: Global VP Product and Marketing

'*We look at where the next top twenty are coming from; priced right, looks right. I check "I can see there is value in the product".*'

Fashion-Three: Design Manager

'*The other thing that we research to great length is price. Price positioning is massive. So I'm very close to the team when they do that and I think my team is reasonably good at briefing out to a price point. Every spec goes out with a target price*.'

Fashion-Three: Head of Supply Chain

'*In price point analysis we showed, for the previous seasons, we've had certain price points that went up to a certain level and then there was a big gap and then there was a couple of shoes in a limited edition which have sold quite well at a much higher price point. So we started talking about this price point between €100 and €140, which is missing*.'

Sport-Two: e-Commerce

'*Yes, we're looking at price. We may really like a shoe but when we look at the price it's a no*.'

Walk-One: Review Meeting

'*It will help with the sales pitch if there is a price point difference*.'

Foot-One: Review Meeting

'*The target price point for this new style is €35. It is a new prototype but it will be a challenge for us. We're trying to find the gap between entry level flip-flops and the premium brands.*'

Foot-Two: Review Meeting

'*What is the price of the equivalent key competitor? It's the SC product at €150. It's the dominant force in the market and they've taken share from us. There needs to be a separate discussion about what our pricing should be in comparison to our key competitors. We probably need to pitch in just under them.*'

Fashion-Three: Review Meeting

'*It's really nice but do we need 4 styles at that price?*'

'*This is not a big area for us, do we need 2 brogues at that price point?*'

'*This is the right price gap in the range for this style, between a shoe at €45 and a welly at €75*.'

'*€170 is difficult, €160 is better*.'

Price elasticity is understood

The price architecture performance is also determined by the understanding of price elasticity. The application of price elasticity knowledge, for a particular portfolio or product, can have significant effect on volume and margin performance.

Walk-One: Category Manager Mike C

'*For example during 'pre-lining' again there will be certain objectives that I want out of the meetings with the retailers, so I'll want to get a better understanding of their volume, price points and curve. I ask "what kind of sales do you have on €200+ pants" and usually they'll give you a fairly honest indication, on how many styles they can take ranging above €200.*'

'*Also sometimes we push prices up to hunt a percentage margin, we lose sight that you have to review your volume. We expect the volume to stay the same but the market size doesn't just suddenly change. If you change your price you have to review your forecast*.'

Sport-Two: e-Commerce

'*There is price sensitivity and there is not. So the best-selling product in October for men is the most expensive product on the site. So the most expensive product has delivered the highest revenue. That would suggest that there isn't price sensitivity if it's the right product*.'

'*I think there is price sensitivity at a lower level where there is not enough differentiation in the product; material, design, or competitor product*.'

Fashion-Three: Review Meeting

'*Can you give us forecasts at the different price points? Maybe it's only a direct retail option*.'

Similar price architecture performance findings are also noted in the external brand interviews:

External Sport Brand B: Merchandiser and Key Account Manager
'*Strong price architecture from entry level to premium.*'

External Sport Brand C: Designer
'*The range plan from the Product Line Manager would include a good/better/best pricing structure and statistics on what was successful in the previous seasons. There would also be stats on competition best sellers. You knew the price of the garment and what fabric you could have, because the price would dictate the fabric.*'

5.3.4 Objective Informed Decision-Making

Management consider that NPD portfolio performance has improved if more "objective" and informed decision-making is applied. More objective decision-making is measured by whether Product Management acknowledges problems, that emotion in decision-making is "managed" and that there is conviction and confidence from the use of analysis and market research "insight". It is also considered a basic performance requirement that there is responsiveness to historical feedback information when building the product range.

Problems are acknowledged by Product Management

Good portfolio performance is demonstrated when Product or Category Management recognize problems that need addressing and showing honesty with products being developed that are unlikely to be successful.

Walk-One: Merchandising Manager
'*In the Product Management team forum we are starting to "slap them in the face" with performance. So that they recognize the problem*.'

Sport-Two: e-Commerce Team
'*It can be very deceptive because we second guess ourselves. We've sat in meetings, we've made decisions as a team, and we lose our "bottle". We're backing one colour and everyone else is backing another colour*.'

'*It is better to go through it with them one-to-one rather than in a brand presentation. A good category manager will take you through* [the range] *and be honest, "this one's a dog, dog, dog, don't touch with a bargepole…..This is our first attempt, wait till the next quarter to buy-in".*'

Emotion and escalation of commitment is managed

Escalation of commitment was identified in my systematic literature review (Figure 20) as having a moderating effect (Schmidt and Calantone, 1998, 2002; Cooper and Edgett, 2003). Emotion is a feature in the range build activity and higher performance is measured by the ability to "manage" this emotion. The performance concern is when emotion gets in the way of objective decision-making, 'when a decision maker invests excessively in a course of action, more than the information or circumstances should warrant' (Schmidt and Calantone, 1998).

Walk-One: Category Manager Mike C

'*We need a template to strip out the emotion. I think it's a template that we can use sometimes during the "emotive bits" so that you can take that emotion and energy you've put into a product, your vested interest, and say "let's go through the facts again".*'

Fashion-Three: Head of Supply Chain

'*It is very difficult because people who are involved emotionally are not good at killing product. If you have the designers in your range review it's like kicking into touch peoples protégés and stuff. It is better to have someone who is a bit more objective there. And actually, in proper way, explain to the designers why something has been dropped or shelved*.'

Fashion-Three: Head of Sales

'*We've always felt that we do it in a raw basic kind of way, range building, critical path, whatever you want to call it. But it has always been quite sort of effective. However, I think that it's been good to get us to where we are now, we need to move on. I think we've got to be more critical, think more analytical around it. I think the last review meeting was one of the best we've done but it's always been based on people's personal opinions and just feelings really. Whereas this one there was a lot more "intelligence" being put into it. I think there needs to be more of that*.'

Sport-One: Review Meeting

"*Remember, it's never personal, it's all about the shoe*"

Walk-One: Focus Group

'*Apparel product decisions are more subjective and too much subjectivity is used in the range review*.'

There is conviction and confidence in the range build

The findings show that the use of market research and supporting analysis is crucial to providing more conviction and confidence which further improves the performance of objective informed decision-making. Therefore the level of conviction and confidence in the range build is identified as a performance sub-categorization.

Sport-Two: Product Director

'*I've always tried to have conviction about what we're doing. You also need intuition. It's the capability, knowing whether the shoe will fit the market. It's judgement, intuition and insight*.'

'*Always try to have conviction from the early Line Planning stage. The Line Plan is not "fixed" until the Line Review, when the first prototypes come through. Some products have a difficult "birth" and are worth persevering with*.'

Fashion-Three: Managing Director

'*Where we are now is the fact that we're a lot clearer on the range categorization. We're now looking at what are the key drivers from an analysis point of view, that will allow us or inform us to make the right decisions*.'

'*Plus we're a fashion brand. It's very fluid. It's very quick moving, as well as all of the analytical stuff you can bring to the party as well, which for us is I'm hoping over time will make our decision-making more informed and robust*.'

'*I think we've got everyone in the room on the right journey, what we haven't got is the right information to help it*.'

Fashion-Three: Head of Supply Chain

'*The Design Manager has now got far more confidence to turn around and say no, actually we've done some research. Very interesting behaviours because the Design Manager now almost has the tool kit where previously he was almost glad to go "oh well, we'll try and get the price down a bit"*.'

Sport-One: Supply Chain Team Leader

'*It's quite ambiguous and it's quite…."we think this product will do 20,000 units", there's no substance behind it, it's "just what I think".*'

Responsive to feedback data

Capturing historical feedback data is not considered as high performing unless the brand responds to that information with action (Kennerley and Neely, 2003).

Sport-One: Focus Group

'*We are responsive to feedback data.*'

Sport-Two: Business Analyst

'*First of all you have to look at what's been achieved by each area at each stage historically for each quarter. So in Q1 this year, Q1 last year, you should see a rough kind of, flip flops are doing x% in this market, to start with it's looking at historic trends and historic data. The next stage is to talk to the sales guys and see what's happening in their markets. Also what's happened, not just in the equivalent period in the previous year, but look what's happened recently, so if we've seen a trend up in outdoor shoes do we need to raise that.*'

There are similar findings from the external brands on the problems of 'subjective decision-making' and the 'big issues' of emotion:

External Fashion Brand A: Sourcing Director

'*The product decision-making was subjective. The two opinions that counted in that meeting were effectively the Sales Director and the Managing Director. If it came down to a subjective decision it was for the Sales Director to "hang his hat on it" and say "yes, we can sell that". Or the MD would pull out his trump card.*'

'*One of the biggest issues we had was emotion. It would turn into an emotional meeting rather than a factual based decision-making meeting. It didn't matter how many facts you were trying to present. It was probably more the nature of the people we had in there because we had quite "defensive" decision makers.*'

External Sport Brand B: Merchandiser and Key Account Manager

'*It's the way we've been trained and used to working. You feel that you need to have the analysis there. Also it's quite an emotive brand, there's a lot of emotion behind it.* [Retail] *Buyers are also quite emotive about it. If you had the facts and the data to support it you can cut-through that emotion, which made our lives a lot easier.*'

5.3.5 Up-front Planning Performance

The NPD portfolio performance is also measured by the quality and activity of up-front planning. The identified performance sub-categorizations are firstly that up-front product plans are agreed early, secondly that up-front planning enables flexibility to be "planned in" and also the "full picture" is seen in time to react to market changes and emerging trends.

Up-front product plans are agreed early

The higher the performance of up-front product planning, the earlier product considerations, implications and assessments of anticipated commerciality are built into range development.

Walk-One: Category Manager Lisa R

'*The proto meeting is whether the product, in 3D, is going to meet expectation. At this stage it's too late. We need to agree the SCO plan early, up-front and consider the implications early on.*'

Fashion-Three: Managing Director

'*We think that for the next development cycle we're going to do a lot more work up-front where at the moment what we've tended to do is to go a little way through the stages of development and then worked out what we think our optimum SCO count is and then had to cull in line with that*.'

Sport-One: Focus Group

'*We do not identify early enough products that are not commercial or will not be bought* (from a vendor).'

Walk-One: Focus Group

'*There is not enough upstream planning*.'

Sport-Two: Business Analyst

'*That's the key to managing the costs. It's just being able to plan upfront*.'

Fashion-Three: Managing Director

'*The Design Manager is now keen to have that information up-front, so that he can sit down with his designers and say I need ten styles in that category*.'

Flexibility is planned in

The findings show that management consider plan rigidity through the NPD process is unlikely to deliver higher portfolio performance. Therefore better up-front planning can provide measurable improvements in having more "flexibility" through the range development activity. This flexibility allows responsiveness to changes in requirements during the development period.

Walk-One: Category Manager Mike C

'*More up-front conversations, building a more accurate margin model, balancing the different product margins, strategic and core product*.'

'*We need to engage in the conversation much earlier in the process, review the "strategic" product, low volume and low margin. We know what's going to be difficult. We need Finance to help us build these models. To create a balance of the products and margins*.'

Sport-One: Supply Chain Team Leader

'*If you knew it earlier what you know at the end you wouldn't have invested all that in the first place*.'

Seeing the full picture in time to react

Management value the ability to see the "full picture", the whole anticipated outcome, as early as possible (Miller & Friesen, 1982; Karlsson and Åhlström, 1997; Bisbe & Malagueno, 2009).

Sport-One: Focus Group

'*We don't see the full picture till too late and we're not fast enough to emerging trends*.'

Fashion-Two: Focus Group

'*We don't have the right information up-front, and market analysis*.'

'*There is a lack of strategic business needs, we're having to be reactive*.'

Sport-One: Supply Chain Team Leader

'*If you've got a more accurate forecast at the start of the process, before you've even started developing it, it would be easier to say "hang on a second, do we really need*

to develop another brand strategic product". Before the blood, sweat, tears and personal bindings have begun with the product.'

5.3.6 Cross-functional Alignment

"Cross-functional alignment" is seen as an important measure of range build performance. The single performance sub-categorization in the findings is being "joined-up at the big picture" with alignment and balance of goals across the functional requirements. This is a measure of strategic alignment.

"Joined-up at the big picture" with alignment and balance of goals across the functional requirements

This measure is characterized by clarity of direction in brand objectives for the range, collaborative decision-making, especially in stage-gate review meetings, and alignment of brand goals and functional objectives.

Walk-One: Category Manager Lisa R

'*I don't get clarity on the background and changes, for example new accounts. "We're not joined up at the big picture"; Business Development, Sales, Regional Management and the Product Managers. It needs to be aligned*.'

'*It feels as though we're aiming in different places or lost in translation*.'

Walk-One: Regional Sales Manager

'*We need to look at the big picture. It will help on product decisions in the review meetings*.'

Fashion-Two: Group Interview

'*We haven't given clear direction from the top in terms of brand objectives and therefore for whoever is leading each area to be clear, "OK this is the three year plan, this is what me as the product manager has to achieve"*.'

'*I would say that Sales is too influential leading the decision-making process*.'

Fashion-Three: Head of Supply Chain

' *"OK, so what are we going to do guys?" Because the range which has been developed is not going to deliver the financial forecast. So actually it's all pie in the*

sky. It's madness. And I think a lot of that has to do with people responsible for the financial budget, the MD and the Finance team didn't think "what kind of range do we need to deliver this?" Because the time-scales were slightly different. And of course the range is done before you do the financial budgets.'

'*Obviously the Sales team are at the front end trying to sell it but of course they don't consider things like SCO productivity. They don't care about SCO productivity, they don't always think that much about margin because they're actually bonused on top-line sales. So some of the things that we had in the business actually drove almost like the wrong behaviours. And I've seen range reviews where people have gone "wouldn't that be good in green", and it's already in five colours*.'

'*Consumer segment together with our product segmentation, matching the two things up*.'

'*The individual bully behaviours. It's not bullies, it's strong personalities, with an individual agenda. And it's very difficult to have an individual agenda on blue shoes when you've got a body of people who are working together and coming up with saying actually "our ideal SCO count is this". If something comes in, we need something to go out*.'

Walk-One: Category Manager Mike C

'*It's not just in my head, it's what's been communicated at our cross-category "alignment meeting" where we brainstorm what the stories are*.'

'*The cross-functional input at the point of decision has to be collaborative*.'

'*We need to look at what are the underlying objectives and outcomes that we want*.'

Sport-Two: Business Analyst

'*Marrying it all together as well. At the moment we've got our Category guys designing shoes and saying we're going to sell a 1,000 pairs of this. Then it goes to the sign off process and it's signed off based on that. Then the Sales guys are completely divorced from that and give us a report of how many shoes they think they will sell. They don't say how many of each shoe. It's not joined up and there's no comeback*.'

Fashion-Three: Managing Director

'*You've got a much more complete package that you're working with, rather than it just being driven by the Design. In fact that now is one cog in a big wheel, rather*

than being the wheel itself.'

'*A massive part of vendor engagement is not wasting a lot of their time*.'

Foot-Two: Review Meeting

'*You don't need to bring many options to the market. Maybe four will do. We have to watch the level of development resource. Does anyone think we'll do more than 5,000 pairs on this next year given that we are doing 2,000 pairs on one style at the moment? It'll help rebalance the volumes better between the factories. Especially since we are in two new unproven factories.*'

These findings are a strong common theme with all the external brands:

External Fashion Brand A: Sourcing Director

'*We had the budget number, which was usually set "up here" somewhere. We had the merchandising number based on the range that we'd signed off. And then we'd have to try and make the two meet.*'

External Sport Brand B: Merchandiser and Key Account Manager

'*What was positive about the E Sport B strategy is that they have these "icons" and "franchise" strategies. That means they have a consistency across the globe, so that in every market you go in, and whatever the story for that season, they have that global consistency. They have "models" that go deep into and tell a whole story for that season and they will invest hugely around that model, which is fantastic. Where they do lack in the local relevance, they have these icons and franchises but they also have the most amazing innovation to negate any of the downfalls. It's the innovation and the marketing.*'

'*It was a bit strange because we would be putting assortments together but you didn't know how profitable they were because Sales Account Management didn't see the margin. It could be there were 20 shoes in that assortment that weren't making that much margin.*'

External Sport Brand C: Designer

'*It was very structured. For "briefing-in" days, you'd receive a pack and there would be a presentation from the Head of Design, the Design Manager, Creative Director and the creative new concepts were shown. These had been signed-off by the business with Marketing. This is the strategy from a business and marketing point of view. This is what is to be executed at the end. You just need to give us the designs to do this job. So it was driven by creative and marketing strategy.*'

5.3.7 Performance Metrics

The “hard” metrics encompass the ultimate or principal outcome measures of range building performance. This distinguishes these measures of performance from all the other performance measurement findings identified in developing the Portfolio Performance Framework.

The ultimate sub-categorized performance measures identified are cash margin and cash margin product productivity. These measures were expected given that they were core measures recognized in the scoping study that led up to this research project. Portfolio value is the realised profit when the NPD portfolio is launched and sold into the market.

Other “hard” measures in the findings are conversion hit rates, average order size by vendor and delivery performance.

Cash margin and cash margin growth

This performance sub-categorization is the ultimate range build “hard” performance measure, the ability to generate growing cash margins from product sales into the market. The findings demonstrate management efforts to improve the performance of all the NPD portfolio performance categorization drivers recognized in these results that ultimately improve and grow portfolio value; pricing, better and earlier forecasting, product commerciality, up-front planning, size and composition of the range, more objective informed decision-making and strategic alignment.

Fashion-One: Managing Director
‘*Our big challenge is margin, a combination of price positioning and getting target ex-factory prices*.’

Foot-One: Category Manager
‘*The benefits of earlier forecasting is that it can protect margin and ensure good margins on bigger volume sellers*.’

Walk-One: Global VP Product and Marketing
‘*What’s delivering profit? What isn’t and stopping it*.’

Sport-Two: Product Director

'*I "Boston matrix" the range to assess cash profit performance*.'

Fashion-Two: Group Interview

'*So for me it's a huge opportunity, small little fixes to get this right, holding their hands, take them along the process and we will extract a percentage point along the way. I think there's some serious margin to be gained out of this*.'

Sport-One: Category Manager

'*We do two things. I would look at a top down view of the size of the category over the previous seasons and realistically, where we should be aiming, at a volume level and gross margin targeting as well. And we also build bottom-up, so the product teams have to build the product range bottom-up, by season. I'll set their targets around range size, SCO counts. I'll give them the shape and direction and I'll ask them to build their ranges and propose it back to me*.'

Fashion-Three: Managing Director

'*I think when you're at the front-end of the business and you're looking at it from a front-end top-line business, you don't really understand the implications of what's happening in some of that, the range planning decision-making. Whereas now the mindset is fundamentally, our profit margin at the end of the year is driven by the decisions at the beginning. So really that's the change in mindset*.'

'*So now we're looking at the various functions within the business, that the insights that we can bring from those, give us more informed decision-making. So there's the whole supply chain KPI piece, which is looking at our performance with various vendors, looking at our capability from a vendor side, if you like. Then range size, SCO analysis. What is driving the profit, what's not?*

'*If you look at our business on the mens side, there's your entry price formal product, the real volume cash margin driver*.'

'*But what we don't do at the moment is say 'that category there is responsible for x amount of our turnover and profit for the next 6 months'. We tend to sort of be "we need that amount of SCOs in it". It doesn't all tie together to the end goal, which is, just of course, your margin*.'

Fashion-Three: Head of Supply Chain

'*Providing input in terms of construction, materials, sole materials, what the margin on a rubber sole is compared to a leather sole. Can we balance the range out and*

introduce more product that gets us to a higher margin?'

'*So we are doing "this is all what we did last season", this is how we performed, these are the kind of shoes with high margins that you didn't sell many of "think about that". These are the shoes that you sold loads of "that had bad margins". But we're doing all of that, setting a context, you have that then people actually don't want to say let's make it all in green. Because they actually realise they sound stupid*.'

Product productivity (cash margin / volume)

The significance of this performance sub-categorization is the role of the measure as a "FAC metric" discussed in the FAC Framework section of the results. The findings show how the measure is used in product selection; as a target, a measure of range build productivity, getting the target value from the level of resources applied and determining preferred range size or product count. The ability of this measure to guide the decision-making challenges on "control versus creativity" is seen as a significant finding of this study.

Sport-Two: Product Director
'*I think we can get to 6,500 – 7,000 pairs per SCO*.'

Sport-Two: Business Analyst
'*This is how many shoes we're forecast selling but we're better off selling half the number of pairs using X number of shoes less if that makes sense. Half the number of SCOs generating the same volume*.'

'*We can turn round and say, "we know that we're going to sell X,000 number of this type of shoe", we can maybe do some forward purchasing on some material as well. That then negates any potential risk, you're really trying to protect the margin as much as you can*.'

'*It's making the shoes work as hard as you can*.'

'*People are really busy doing things that are not making a difference. It's a waste of their time and it's a waste of money for the business. And that will also allow us to think about setting what targets for which category and gender in main range*.'

Fashion-Three: Head of Supply Chain

'*So we actually started saying you need to have a much higher SCO productivity because it costs you the same to develop a shoe that you're making 300 of, or 3,000 of. So let's actually try to work on SCO productivity. In order to improve relationships with our vendors and that then just drove different conversations in the brand really*.'

Sport-Two: e-Commerce Team

'*The Category Manager is bringing his SKU count down for Q3 and ideally push more through with that reduced SKU count*.'

Sport-Two: Review Meeting

'*Let's say we do 3,000 pairs per SCO, which is low. We should do 78,000 pairs out of all those SCOs. I'm sure we can do that*.'

'*We do 6,800 pairs per SCO on this product. We need to get this right and the price right*.'

Fashion-Three: Review Meeting

'*The current development on Mens going into the review is 263 SCOs. For the SCOs to launch we need to reduce the tail and get to 175. This is the target SCO count to drive more efficiency. We need to be stronger in our decision making; what we need and what we don't; what appears to be a luxury and what isn't; any duplication*.'

Foot-Two: Review Meeting

'*Are we specifically excluding membrane with leather? Could we develop 3,000 pairs on a SCO with no membrane? Is it too niche? You'd have to get that one competitor product off the shelf and replace with ours.*'

Conversion hit rates

This performance measure assesses how many products that are designed and developed end up being purchased by customers, post market launch. It is a measure of the brand capability to design and develop products that customers "buy into".

Walk-One: Focus Group

'*A good conversion hit rate*.'

Average order size by vendor

This measure is directly linked to product productivity. If there is a higher product productivity the average vendor order size, the product purchase order volume placed between the brand and the vendor, will also increase. The significance as a sub-categorization measure is in the crucial role of managing vendor relationships. This measure was also explored in the project scoping study.

Fashion-Three: Head of Supply Chain

'*It came into my head from a supply chain point of view because when I first met some of our vendors the main thing they've said, they've got lots of moans and whinges around the way we worked, but it was basically a very very poor conversion rate and a very small average order. So we did lots of analysis on what our average order sizes by vendor were*.'

Delivery performance

The delivery performance of product to end customers is a key measure.

Fashion-Three: Head of Supply Chain

'*That's not me training people on forecasting or providing super forecasting tools, it's not us talking around the reason that forecasting is good because it means we can book capacity. If we can book capacity it means we can much more tell you when we can make shoes and we can be much better to guarantee delivery to customers. It's not any one of these things. It's the ten things that we've all done has meant that people now think forecasting is important, they take it seriously, and they now know if they forecast better they're likely to get a better bonus at the end of the year*.'

Cash margin, %margin and SCO productivity are also key portfolio performance measures used in the external brands:

External Fashion Brand A: Sourcing Director

'*The challenges were usually around Sales saying they needed a wider range, that they needed more options and myself and Merchandising challenging that because of what had happened in previous years. In previous years we would have developed so many styles and we dropped…, depending on the category we could have dropped up to 50% of what we developed.*'

'*We'd have the financial performance. We knew the margin. We knew the product categories we made good margin on and the ones we struggled on.*'

'*We would say a product has to hit a certain number or it's not worthwhile putting it in the range.*'

External Sport Brand B: Merchandiser and Key Account Manager

'*I think in Sport-Two there is too much product. There's no SKU efficiency. That was a huge driver at E Sport Brand B. "Edit to amplify" was the strapline, "You go deeper in the models and blow out the colourways". SKU efficiency and a lot of analysis is something we're missing at Sport-Two, we don't have that merchandising skill-set. At E Sport Brand B we'd be building our ranges and looking at SKU efficiency, "going deeper" in models and recognising that maybe 40% of the range was redundant or doing less than so many thousands pairs. When you think about how much that costs and how much it reduces your profit.*'

'*On SKU efficiency, we wouldn't even build up to 3,000 pairs and then it went up to 5,000 pairs. That was the absolute minimum. That would be for Europe, a European minimum. You could select reduced minimums on certain new lines, especially using new technology. They would allow you to do 1,500 units per colour, just to "get it out of the gates". This was done with the view of building long term franchises and income.*'

'*It was also linked in to margin. So as merchandisers we would have visibility, on the spreadsheet, the margin would be linked in to the forecast. You could see the whole range. I could get a % margin forecast for my whole range, my ranges were "delivering so much % margin".*'

'*Different categories had different target margins. Football versus running, compared to sportswear. They all had different margin expectations. I would have had a category target on volume, sales and margin. Everything had to be brand enhancing, "everything executed was value-add", market place management, on-brand.*'

External Sport Brand C: Designer

'*There were target volumes, at style level, in the briefing pack. For each product group there would be a target % margin. A key part of the discussion was on margin, the % margin. Jackets 55%, T-Shirts and Polos 60% and Pants 50-55%. If a product was coming in below target you would make to make a change, a fabric, trim or branding change. It would completely start again.*'

The “hard” metrics are the outcome or output of the overall performance. They are the ultimate measures of performance, as considered by management. It will be important in the planned action research study to capture changes in cash margin, a proxy for portfolio value, and product productivity with the FAC intervention changes.

5.3.8 Final Portfolio Performance Framework Development

The key categorizations of range build performance have now been captured by empirical study. These categorizations and sub-categorizations are:

- Range structure performance
    - The role of each product is justified, with no unnecessary complexity
    - Any overdevelopment is understood and managed
    - Duplication, cannibalisation and divided sales are avoided
    - Minimum order quantities are achieved
- Design performance
    - A performing “core” with newness brought in
    - Core product is replaced when required
    - Range recognises new categories and trends
- Price architecture performance
    - Right price points, architecture and price curve
    - Price elasticity is understood
- Objective informed decision-making
    - Problems are acknowledged by product Management
    - Emotion and escalation of commitment is managed
    - There is conviction and confidence in the range build
    - Responsive to feedback data
- Up-front planning performance
    - Up-front plans are agreed early
    - Flexibility is planned in
    - Seeing the full picture in time to react
- Cross functional alignment
    - “Joined-up at the big picture” with alignment and balance of goals across the functional requirements
- Metrics
    - Cash margin and cash margin growth
    - Product productivity (cash margin per product)
    - Conversion hit rates
    - Average order size by vendor
    - Delivery performance.

At this stage of the study there is no prioritization of these categorizations of performance. Also they have no “weighting”. No single categorization is recognised as being more important than any other categorization. Therefore in presenting the results of the second framework the categorizations of performance should be shown as having equal importance, when compared to each other. However, the “metrics” are different in that they encompass the ultimate outcome measure of portfolio value. Therefore the metrics categorization needs to be presented in a way that represents this difference.

I decided that for graphical purposes the best way to present the categorizations having no prioritization and with equal weighting would be to put them in a circle, with each categorization being a segment in the circle. This has been put together as shown in Figure 31 with the sub-categorizations given direct linkage to their relevant performance categorization.

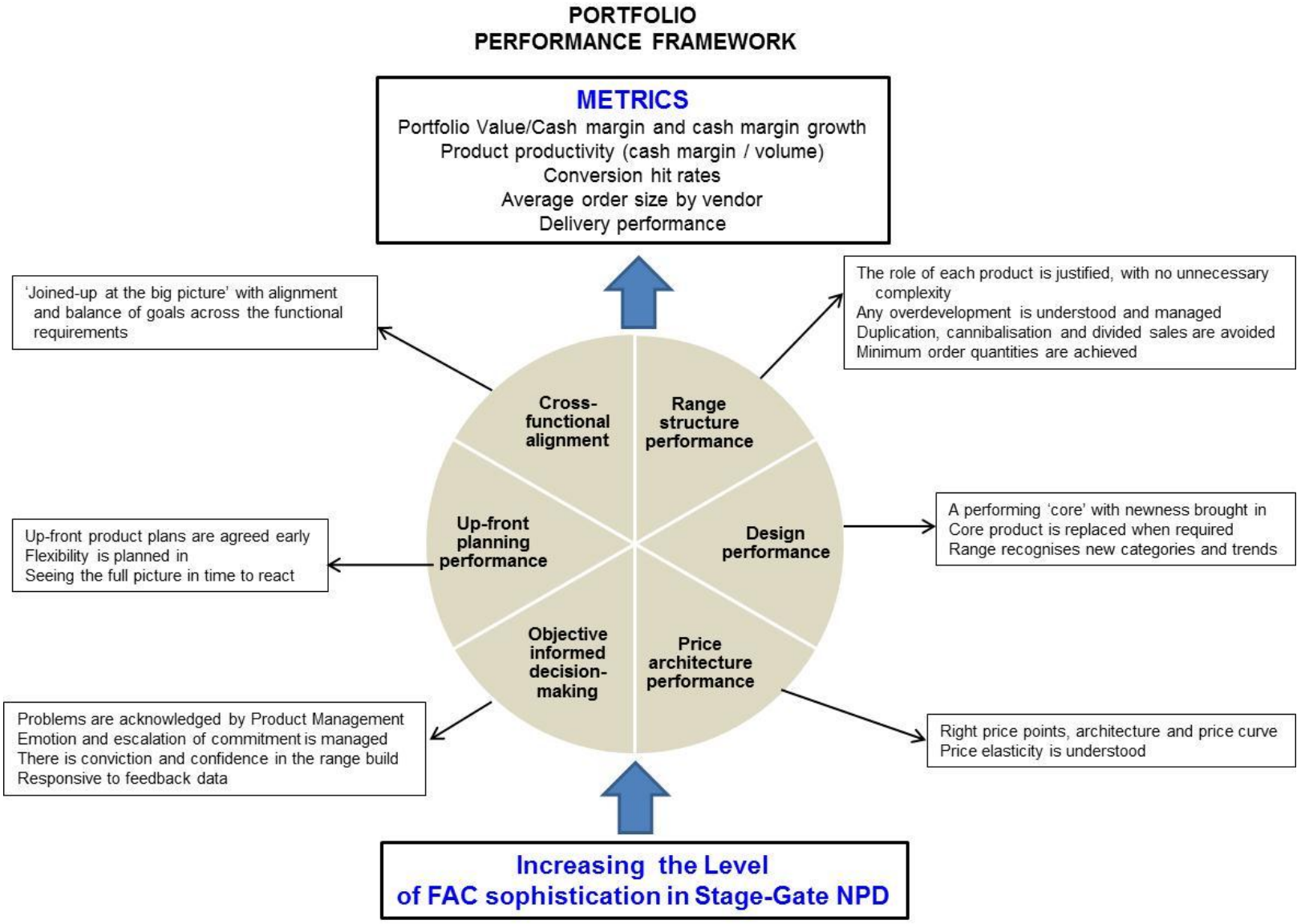
The planned purpose of the final empirical study (Figure 19) is to demonstrate that by increasing the level of FAC sophistication NPD management teams are influenced to improve the ultimate performance measures of portfolio value and product productivity. Therefore the Portfolio Performance Framework needs to show “Increasing the Level of FAC sophistication” as an “input” activity and portfolio value/cash margin as an “outcome”. This is the way it is presented in Figure 31.

6 CROSS-CASE COMPARISON: FAC LEVELS OF SOPHISTICATION AND REVIEW MEETING OBSERVATIONS

The two frameworks have now been developed for the planned action research study (Figure 19). The first part of the action research interventionist study needs to capture the extant FAC level of each unit of analysis, using the new FAC Framework. The empirical work completed so far has enabled me to identify the FAC level of sophistication for each brand and this is presented in this section using a cross-case comparison schedule.

The review meetings observations also allow me to do a cross-case comparison of the stage-gate meetings, which I discuss next.

Figure 31


PORTFOLIO
PERFORMANCE FRAMEWORK
METRICS
Portfolio Value/Cash margin and cash margin growth
Product productivity (cash margin / volume)
Conversion hit rates
Average order size by vendor
Delivery performance
'Joined-up at the big picture' with alignment and balance of goals across the functional requirements
The role of each product is justified, with no unnecessary complexity
Any overdevelopment is understood and managed
Duplication, cannibalisation and divided sales are avoided
Minimum order quantities are achieved
Cross-functional alignment
Range structure performance
Up-front planning performance
Design performance
Objective informed decision-making
Price architecture performance
Up-front product plans are agreed early
Flexibility is planned in
Seeing the full picture in time to react
A performing 'core' with newness brought in
Core product is replaced when required
Range recognises new categories and trends
Problems are acknowledged by Product Management
Emotion and escalation of commitment is managed
There is conviction and confidence in the range build
Responsive to feedback data
Right price points, architecture and price curve
Price elasticity is understood
Increasing the Level
of FAC sophistication in Stage-Gate NPD

6.1 Cross-Case Comparison

This sub-section presents the extant levels of FAC sophistication, by brand, using the new FAC framework, in a cross-case comparison schedule.

The completed FAC Framework can be used, as intended, to categorize the current FAC sophistication levels of the studied brands (Table 9). This is presented in a cross-case comparison of the FAC levels observed. The categorization has been determined by assessing the findings from each brand and connecting to the most appropriate FAC categorization.

Table 9 FAC Levels of Sophistication: Cross-case comparison

FAC Level	1 Actuals	2 Category forecasting	3 SCO forecasting through NPD	4 Category FAC metric	5 Scenario planning	6 Review Category targets	7 Review FAC metric targets
Sport-One	x	x					
Sport-Two	x	x	x	x			
Walk-One	x	x					
Foot-One	x						
Foot-Two	x	x					
Fashion-One	x						
Fashion-Two	x						
Fashion-Three	x						

As noted in the findings, all brands have achieved Level 1, the use of “actuals” and feedback information. Four brands have achieved Level 2 (Table 9) and only one brand, Sport-Two has reached up to Levels 3 and 4.

None of the studied brands carried out structured scenario planning (Level 5) or double-loop learning review of Category or FAC metric targets.

All the studied brands represent FAC intervention opportunities for the planned action research study.

6.2 Review Meeting Observations

A cross-case comparison of the observed review meetings, of five of the brands, is discussed in this sub-section.

A summary of qualitative findings, from the two protocols of “General aspects to capture” and “Range Review Meetings” is presented in Appendix P.

These results also reflect the low level of FAC being applied, except for Sport-Two.

The number of SCOs reviewed per hour of review meeting is significantly different between brands, with Sport and Fashion brands (Sport-Two 72, Foot-One 64, Fashion-Three 62) being much higher than the technical outdoor brands (Walk-One 6, Foot-Two 9). “Fashion” compared to “Technical” being the key contextual factor.

Fashion-Three: Managing Director

‘*You spoke about us moving through quite quickly, the one thing I have been involved in is when you procrastinate in those meetings as well and you go round in circles. And actually what’s the right decision which is out there, you can take so long over it. And in my opinion, it’s like everything, if you take too long you’ll probably revert back to the safest option because you have too many opinions in the room and someone will eventually turn around, and it’ll normally be the leadership who turn round and say ‘right let’s just stick with it’ because that’s the safest easiest option. You need to keep an element of pace in the decision. You’ve got all the information there. You’re discussing the information. Once you’ve discussed it once or twice you need to make a call on it. I think procrastination tends to lead to safety in my opinion.*’

All the meetings exhibited collaborative product selection but none utilised an overall commercial value sense-check at any time during the observed reviews.

7 RELEVANCE AND RELIABILITY CHECKS

The methodology section noted that the addition of findings from “external” brands augments relevance and supports reliability. These findings are now discussed and confirm that the external brands use range review meetings in their stage-gate NPD processes and also incur the challenges of achieving both control and creativity.

7.1 “External” Brands Findings

As described in the methodology section, in building the frameworks, findings from the external brands have been incorporated with the results from the studied brands. This approach has been used to support greater relevance of the findings.

In addition to this application of the external brands findings there are two identified more general aspects that also support relevance. The first is the external brands use of “Range Review Meetings” and the second is the common finding of “control and creativity”. The second finding is significant from a relevance perspective because it relates directly to both the systematic literature review findings and also the role of FAC in guiding product selection.

Range review meeting participants

All three external brands have range review meetings in stage-gate NPD processes. By brand the participants are:

External Fashion Brand A:

‘*Designer, Product Developer, Designer and Developer present the range, Sourcing Director; sourcing, product development, QC, Merchandising Manager; create the original range brief, Merchandising Director, Joint Managing Director/Head of Design/Head of Sales.*’

External Sport Brand B:

‘ *“Global direction meeting”: Global creative meets with regional merchandisers for one week. Merchandisers feedback if there are any gaps, or general top-level feedback on the collection. The range would be confirmed at the end of that week. Next an “in-house” meeting is held with key stakeholders; key account managers, strategic account managers, called a “Seasonal Integration Meeting”, with proposed sales distribution channels and “top-line” product review.*’

External Sport Brand C:

‘*A main Board member, Creative Director, Head of the PLMs, Product Development, Fabric Development , PLMs, Designers. The PLM covered the merchandising role.*’

Control and creativity

Control and creativity was a key coding identified in my systematic literature review. The Portfolio Performance Framework shows the role of Range Structure and Design Performance in improving portfolio value, to be tested in the planned action research study. Design performance and cash margin are two key features of the framework that relate directly to the challenges of "control and creativity". Therefore these related findings from the external brands are significant from a relevance perspective.

External Fashion Brand A:

'*SCO productivity was mainly used to show, as an example, how we were becoming more difficult to work with for suppliers. We were getting growth in the size of the range but volumes were staying static. We were diluting our sales across more products. SCO productivity went down from 1,500 to about 600.*'

External Sport Brand B:

'*I think it was absolutely the wrong thing not to have a localised "pod". Our role was essentially fighting for and justifying our commercial product needs. It was driven out of the USA. It was a very US centric view. We would be presenting product to key UK accounts who would say that the product is not relevant but there was nothing we could do about it. We would have to drive it through SMU. Even the SMU was limited. Was it in line with the global vision and the category vision? The most frustrating bit was trying to lobby for more locally European relevant pieces and stories.*'

External Sport Brand C:

'*The range review meetings were so focused that you felt like a "[Apple] mac monkey". You did feel as though you were just designing by numbers. Which is good and it's bad. It's good because you're focused, you know what you're doing. But it's bad because you're not free to be creative. It was just frustrating. You would have a great creative direction at the beginning of the process and when you come to the 100% review it would always work its way back to basic product with a different type of logo.*'

'*I think that there was so much information there and structure. But it really compromised creativity. They've brought in new people to lift the creative boundaries. You could feel the change immediately because the top people were asking creative questions straight away. Whereas before it wasn't even a discussion. It was margins, numbers. You had designers who didn't even really try because they*

thought this is what I've got to play with, here you go. But I did learn a lot about structure, guidance and destination from it. A business that knows their destination. And a team working together to get to that destination.'

Therefore achieving control and creativity is also a crucial challenge for the external brands.

7.2 Feedback and Sense Check of Results with Informants

It is important at this stage of the overall project to sense-check and validate the two frameworks with informants in the studied brands. This sense check of the resultant frameworks has been carried out with 15 knowledgeable informants and enhances reliability, both for the output of this project and in preparation for the final empirical study in Project 3.

The sense check informants' brands and roles are presented in Table 10 and the protocol used is shown in Appendix Q.

Table 10 Frameworks Sense-check: Informant Brand and Roles

Brand	**Role**
Brands Group	Chief Financial Officer
Sport-One	Brand President Category Manager Supply Chain Team Leader
Sport-Two	Product Director Business Analyst
Walk-One	Finance Director Chief Operating Officer Category Manager Merchandising Manager
Foot-Two	Managing Director Product Manager
Fashion-Two	Managing Director
Fashion-Three	Managing Director Supply Chain Manager

The feedback comments demonstrate overwhelming informant understanding and approval of the results and perceived recognition of the performance benefits effect of changing the level of FAC sophistication.

Unprompted, as per the protocol, many of the informants easily and willingly identified the FAC sophistication level for their brand.

The findings from the sense check presentations also show that some informants made an almost "immediate" decision to adopt the ideas and are motivated to achieve higher levels of FAC sophistication. From a research study perspective this can be taken as the starting point for intervention. Therefore the final empirical study has started with the sense check of the frameworks with informants, at the end of my first empirical study.

These sense check findings are also important from a "relevance" perspective, which is important for achieving the requirements of the DBA.

David R: Sport-One – Brand President

'*I get it entirely. I totally agree. The key is making it happen in a systematic way, with common ownership and understanding. Instead of "cross-functional alignment" I now use "systematic alignment" and being systematic in the way we work together. We do look at SCO productivity and what drove us to that in the first place was when we said that bad SCOs were the problem.*'

Ashley C: Sport-One – Category Manager

'*It makes absolute sense. I guess it's saying the effort up-front makes the output much smoother. I think there is something in taking this better forecasting into the vendor side and planning capacity. We're just getting into that. We're starting to share three year annual projections by style, so they can see the shape of the range with newness planned in and talking about when we're going to discontinue certain lines. Give them more of a heads-up.*'

'*Scenario planning is really interesting. It's something we're only just scratching the surface on. We're looking at Style and SCO level but we're not doing the scenario planning.*'

John R: Sport-One – Supply Chain Team Leader

'It's about doing less and getting more. I can instantly see the framework and levels and where we're at and where we're going. We are trying to dip our toes into the

next higher level.'

'*It definitely makes sense. It puts the range build into a more objective, quantifiable and rational approach, not subjective. It's like that movie "The Matrix", you can see the numbers behind it.*'

'*It's definitely achievable. It's not like a theory you can't apply. I can see the products and applying it to a planning grid. It's everything I've been thinking about and it's in a structure.*'

Gareth H: Sport-Two – Product Director

'*This is something we can definitely implement now. What's nice about this is you can actually talk to people about it. It's a structure you can follow straight away. I want to do scenario planning for the next line review*.'

Marc A: Sport-Two – Business Analyst

'*It's hard for me to think about where we are now and where we're going. To actually have a framework and guide to show where you should go is great. There's nothing in any books on this and I've looked. With this I know how to get there. A year ago there was no measuring in our brand and now I know what to do next. It's so simple and so obvious. But in some ways it isn't because no-one has done this.'*

David K: Walk-One – Finance Director

'*It is exactly what we ought to be doing. It's getting people to think more commercially. It's what we've tried to do over the years but not in this structured way.*'

James H: Walk-One – Chief Operating Officer

'*That's really interesting. There are pockets of it in our business but not joined up. I really like the idea of looking at whether the targets are right. When you're looking at it from a more balanced perspective and against your competitor set it is really useful.*'

'*It's completely virtuous. Once you start on these controls they will start to kick in, maybe at different times and different aspects of the performance drivers, depending on where each brand is. And the metrics will start improving significantly. You're making things work harder, making the assets sweat. The designers will become more effective.*'

Mike C: Walk-One – Category Manager

'These are the stages we are going through. We are going up and down these levels. We have some foundations in place. It's a really good gauge for "honestly, where are we?" This is a really good roadmap. We need robustness in the levels below before really getting into scenario planning.'

Richard P: Walk-One – Merchandising Manager

'The timing is perfect for this. It's very good. I like the "sophistication" terminology. For next season we're effectively between levels 3 and 4.'

Marc E: Foot-Two – Managing Director

'I agree with that completely. It's giving a framework, which I can apply straight away to the business. It's asking "have we got all this information in place?" You're showing how do I make a better decision here. I get it completely, it is a good framework that makes sense.'

Philip G: Foot-Two – Product Manager

'*What you articulate is what I feel deep inside. We have been at the bottom levels and for the past couple of years we have been trying to move to the 2/3 levels but are miles away from the 4/5 levels. I'm actually now starting to use the language of "SCO productivity". At the end of the day what you are giving me is the tools, it's a structure, process and next step sense check. It's not "finger in the air". We can do more up-front, more of a strategic business plan than a short-term vision and doing the targets makes sense.*'

'*It's really powerful. It will influence behaviour. It would be good to lock my guys in a room and work out where we are on this and how we improve. We have been at the lower levels and have been reactive. At the higher levels you anticipate what is going to happen. It's forward thinking at the top levels and it's backward thinking at the bottom levels. At the higher level you can generate better SCO productivity because it's forward thinking.*'

'*The whole point of range building is to be ahead of the market, not behind it. Also you don't want to be too far ahead, the tools can be the control mechanic.*'

Mike S: Fashion-Two – Managing Director

'*It's simple and clear. The beauty of having something like this is these are the performance metrics we are striving for and understand and all the time looking to improve. And we're trying to do all that at Level 1. At that level we're just not going to get that much higher performance.*'

Matt R: Fashion-Three – Managing Director

'*The strategic fit check, that's interesting. With the changes in ex-factory costs and retail price pressures our current plan does not stack up on price and volumes. Our forecast is built on maintaining prices. We're trying to find the right balance between having the right top-line price and the volumes we are looking for. Historically we've targeted our vendors based on one margin% target, we are not flexible. When the cost goes against us we make only one decision, take a hit on margin or put the price up. We will have to target different margins for different categories. We can't have a "one-size fits all" solution to range planning. You do have to take a more sophisticated approach to categorizing the collection. We're looking at it in generic way when we should look at it in a more categorized way.*'

'*I think we're working at Level 1. We're trying to do SCO level forecasting but doing it later in the process. I like the framework. It's where my thinking is at the moment. We need to look at range planning differently. It's good timing and it's a simple framework showing the steps I need to take. I'm going to take my team through it this week.*'

Jon S: Fashion-Three – Supply Chain Manager

'*It's clear and easy to understand. It's that continuous process of education, especially category management principles. Most people don't see the bigger picture, they are focused on their area. The category management piece is not seen, for most people it's more about passing on the baton to the next stage. There is not enough clear ownership and increasing that accountability. It will be important to pitch it at the right level, especially with designers, keeping them engaged without switching them off. It would be good to show examples against each level of sophistication, make it real to whoever owns the range build process*.'

'*We should do this for next season. We should also get the brands together and ask each other where we sit on the levels, "what are you doing with your SCO productivity targets?"*'

'*If people buy into the methodology and approach, when we go through the process they will understand how you get to the outcome and result.*'

Sam G: Brands Group CFO

'It's like having a wet flannel slapped across your face! The 'justification for each product in the range' aspect is powerful and obvious. I've never seen it presented that clearly. You can see that changing the FAC levels will change cash profit performance. We've got too many brands at the lower levels of FAC sophistication.'

These results suggest that there is significant commercial relevance to brand adoption of the FAC framework. This overall applied research study is on management controls in the key value-creating activity within the industry, where there is a scarcity of published knowledge. Therefore these results should not be unanticipated.

8 FINDINGS AND DISCUSSION

Firstly the findings of the FAC Framework are discussed and also in comparison to extant literature. The significance of the FAC metric and the importance of FAC level consolidation are noted. Next the second framework, the Portfolio Performance Management Framework findings are noted and discussed, including the commercial relevance of this framework. The confirmatory findings of the challenge of balancing control and creativity are discussed next and the importance of managing this challenge to continue delivery of value-adding NPD.

The final sub-section summarises the overall findings and considers implications for the planned action research study and develops two propositions for testing in Project 3.

The applied research in developing the two frameworks, to measure changes in two variables in a planned action research empirical study, has generated some valuable findings. These findings confirm theory and can contribute to knowledge of management controls in NPD. They also provide relevance for practice and confirm the challenge of seeking a balance of control and creativity, achieving control without stifling NPD. Validity and reliability for contribution to knowledge can be achieved by the planned action research study.

8.1 FAC Framework

The findings of developing the FAC Framework are examined in this section; the use of FAC in stage-gate screening criteria, the use of forecasting, anticipation of customer needs and the use of strategic performance measures is discussed. These findings are discussed in comparison to extant literature.

It should be noted first that there are some important findings in these results. The identification of an “FAC metric” with the potential to influence performance

improvement and guide NPD management team product selection challenges in control and creativity was not found in the systematic literature review results. The FAC metric is one that management recognises as a key ratio that has to be managed, is a decision-making “shaping” measure, highly practical and appears to challenge people in a different but meaningful way. Another finding is the consolidation of FAC levels, where the achievement of higher levels of FAC sophistication appears contingent on consolidation of application at the lower levels. It also demonstrates the role of additional analytics and the greater application and use of performance management practical controls to these crucial routines in the business. This also needs to be studied in Project 3. Overall, the application of FAC appears to helps management visualise the future.

This study has used deduction, logic and empirical study to build the FAC Framework and confirms the literature on FAC operationalization in NPD but also refines it. The study has built a framework or ladder of FAC sophistication levels, with eight categorizations to increasing levels of sophistication. A finding, to be tested in Project 3, is that achievement of the higher FAC levels is contingent on consolidation of the lower levels.

The findings suggest that for branded businesses with large product portfolios, using stage and stage-gate NPD processes, FAC is applied to a greater or lesser degree in the stage-gate screening and evaluation criteria. The use of screening criteria is well established in the literature (Karlsson and Åhlström, 1997; Rice et al., 1998; Cooper et al., 2002; Cooper and Edgett, 2003; Bisbe and Otley, 2004; Saunders et al., 2005; Jørgensen and Messner, 2009) but not for the role of FAC. The findings of this study confirm the operationalized role of FAC, as found in the systematic literature review, in stage-gate screening criteria.

Another literature confirmatory finding is the significant use of forecasting (Nakahara et al., 1979; Makridakis, 1986; Simons, 1987; Chiesa et al and Noci, 2009), in one form or another, as an FAC activity. The operationalization of forecasting is found at many of the identified levels of FAC sophistication and is typically being used as an anticipatory control (Koontz and Bradspies, 1972; Ishikawa and Smith, 1972, Godener and Soderquist, 2004; Holmes and Campbell, 2004; Poskela and Martinsuo, 2009).

The empirical evidence confirms that brand management teams are observed to be anticipating the needs and trends of customers and consumers (Ciappei and Simoni, 2005; Kahn et Al., 2006; Paladino, 2009; Barge-Gil et. Al., 2011) and they are also attempting to assess market potential for the various market and product categorizations (Saunders et al., 2005; Christiansen and Varnes, 2008).

The use of strategic performance measures (Micheli and Manzoni, 2010) is predominantly observed at three levels, firstly at the overall business level, secondly at product category level and thirdly at the product specific level.

Scenario planning (Miller and Friesen, 1982; Karlsson and Åhlström, 1997), at a product categorization above the product specific level, was not observed and therefore represents an intervention opportunity, that targets the achievement of higher levels of FAC sophistication.

There is evidence, especially from observation of Sport-Two, of the use of management controls to gather and evaluate information to reduce uncertainty in product selection (Bisbe and Malagueno, 2009). This is linked to a key confirmatory finding, as noted in the literature (Micheli and Manzoni, 2010), that feedforward and feedback measures have a vital role in managing NPD portfolio product selection.

The key finding of the FAC Metric, a construct not found in the literature in the systematic literature review, is a feedforward metric of product productivity, that is empirically observed in Sport-Two being used in both feedback and feedforward loops. Again, given the observation in only one brand, this represents an intervention opportunity in the planned action research study.

Therefore, this study has provided findings, both to management control systems theory confirmation and potential contribution, and also to practice. The planned action research study will enhance validity and reliability of these findings and provide the empirical evidence of how FAC influences NPD management teams to improve portfolio value and strategic alignment.

8.2 Portfolio Performance Framework

The key finding of developing the Portfolio Performance Framework is the value to practice.

This framework has been developed to measure changes in range build performance. The activity of range building is the key value-creating activity in the industry and the performance framework has been developed because no comprehensive and robust performance management framework has been found in the literature.

The Portfolio Performance Framework has been sense checked with 15 knowledgeable and experienced informants. The feedback suggests that, to these informants, the framework represents an inclusive measure of NPD portfolio performance that is not currently available in their business or that has been available in other industry organizations they have worked in. Therefore the development of the Portfolio Performance Framework is also an important result given that, in the substantial global branded footwear and apparel industry, there is a scarcity of published knowledge on drivers and measures of performance for the crucial value-creating activity of product range building.

The soft perception measure categorization of “cross-functional alignment” and its sub-categorization of “joined-up at the big picture with alignment and balance of goals across the functional requirements” seems to be a direct perception measure of “strategic alignment”, a concept in the overall research question. Therefore the capture of NPD management teams’ perceptions of changes in performance of this measure can provide evidence for answering the research question.

The key finding from the Portfolio Performance Framework is the value to practice. Given the lack of published information on performance management of product range build this framework represents a significant development. As noted in the introduction, this is in an industry with an estimated global value of $300 billion per annum.

8.3 Control and Creativity

A key finding in the literature review was the challenge in NPD of balancing control and creativity, where too much control stifles creativity and too little control can cause wasteful and excessive NPD (Cowen and Middaugh, 1998; Peters and Waterman, 1982; Davila, 2000). This challenge has been confirmed from the empirical findings in this project.

It is the study findings of this challenge of balancing control and creativity that is both confirmatory of the literature and noteworthy for significance. The Portfolio Performance Framework contains two key performance categories, range structure performance and design performance. The performance of these categorizations is clearly important to growing sustainable portfolio value.

Creativity and innovation are both operationalized as range structure and design. At the core of intervening, to raise FAC levels of sophistication, is to affect range structure and design performance to improve portfolio value. Therefore a confirmed key finding is that to deliver continued value-adding NPD in product range building, grow profits, and avoid excessive and underperforming NPD, a brand firm in the industry needs to consistently find the “sweet spot” that balances creativity and control (Baker and Bourne, 2014; Peters and Waterman 1982 p318; Cowen and Middaugh 1998; Simons 1994; Bisbe and Otley 2004). This requires effective management controls for NPD product selection during stage-gate NPD.

8.4 Implications for the Planned Action Research Study (Project 3)

This final sub-section considers the implications for the next phase of my research.

The two frameworks have been developed for use and testing in the planned Project 3 action research longitudinal study. The frameworks, the FAC Sophistication Framework and the Portfolio Performance Framework are to be used in an interventionist study of changing the levels of FAC sophistication and measuring the resultant effects on portfolio performance.

The sense checking of the resultant frameworks with knowledgeable informants suggests that there is significant commercial relevance to brand adoption of the FAC framework as a guide to improving control and delivering new product development performance. This will be tested in Project 3. This can be achieved by capturing the change in portfolio value post intervention.

Another implication from the findings for the Project 3 study is on the moderators that have not been controlled for in the research design. The three “moderators” that can affect the application of FAC, (the brand) top management control, escalation of commitment and domain relevant knowledge will need to be analysed in cross-case comparison, between the units of analysis, for validity purposes.

The findings suggest that if NPD management achieve higher levels of FAC it will influence them to improve portfolio value and strategic alignment. Therefore two propositions can be developed from the findings, for testing in Project 3, that can help answer the research question:

1) *A change to higher levels of FAC sophistication influences NPD management teams to improve portfolio value.*
2) *A change to higher levels of FAC sophistication influences NPD management teams to improve strategic alignment.*

There are two propositions, since the measurement of portfolio performance will be different from the measurement of strategic alignment.

9 PERSONAL REFLECTION

This section is a brief personal reflection on the project and the results obtained at this stage of the overall research study.

The quality and volume of data has been achieved by having very good access to all the brand units of analysis and all levels of management within the brands. My extensive, broad and deep personal knowledge and experience of the process under investigation has helped greatly to focus on the target study observations of FAC use and management views of portfolio performance in this industry context.

It has been of value to study the product range review meetings in real time and observe the product selections being made. This promotes the ‘good qualitative researcher-as-instrument’ with ‘familiarity, strong conceptual interests and a multidisciplinary approach’ (Miles and Huberman, 1994 p38).

It has been useful to find one brand, Sport-Two, which operates at a relatively higher level of FAC sophistication compared to the other brands. The retrospective data from the Sport-Two findings gives early indications of how the use of FAC can influence NPD management teams to improve portfolio value and strategic alignment. There are also findings from Sport-Two that suggest when operating at a higher FAC level, there is much improved information and preparation in advance of the review meeting. An outcome being that strategic alignment issues are

understood early with greater clarity of the key product considerations required in the stage-gate review.

10 CONCLUSIONS

The conclusions summarise the achievement of the objectives of this study and the preparation for the final phase of research, the final empirical study (Project 3).

The objective of this project was to establish, through applied empirical research, frameworks that can be used in a planned longitudinal interventionist field study that will measure changes in levels of FAC sophistication and changes in portfolio performance. In this Project 2 study I have used literature, logic and empirical inductive development to construct two frameworks, one is the FAC Framework and the second is the Portfolio Performance Framework.

These two frameworks will be used as the instruments for gathering data in the final empirical action research study (Project 3).

11 LIMITATIONS

There are a number of identified limitations. These are discussed in turn below. The list of limitations firstly notes that the study is conducted in only one industry, secondly the need to research high radical innovation product portfolio contexts, thirdly the effect of each of the systematic literature review identified moderators, fourthly the impact of other contextual factors and finally the lack of robust empirical evidence demonstrating that FAC influences NPD management teams to improve NPD performance.

The first noted limitation is on generalizability. The “fast clock” product development speed of the footwear and apparel industry is advantageous from a research design perspective but the study has been carried out in only a single industry. Greater generalizability requires research in other industries that are managing large portfolios of products through stage and stage-gate NPD. This may deliver generalisation refinements to the FAC Framework.

The next limitation considers the innovativeness of the studied industry. The brands studied in Project 2 develop incremental innovation with some radical innovation

(Rice et al., 1998; Chiesa et al., 2009; Schmidt and Calantone, 1998). To increase generalizability requires the FAC Framework to be tested in predominantly high radical innovation contexts with large product portfolios. Different levels of product innovativeness were recognised from the systematic literature review results as having a moderating effect on the use of FAC.

The research design has controlled for many of the systematic literature review (Figure 20) identified moderators. However, to achieve a more complete understanding of the role of FAC in the performance management of stage-gate NPD, the effect of changing these moderators will also have to be studied. The study is limited by not testing for each of these moderators effects on application of FAC.

Next, a potentially serious design limitation is the presence of contextual factors that can affect performance, other than changing the levels of FAC sophistication. Examples of such factors are significant growth when opening new markets, or new sales distribution channels in existing markets, or where there is new “hot”, high growth product in market or where there are significant changes in management. For validity purposes such contextual information will need to be captured in the planned final empirical study, though if such factors are present it becomes more difficult to isolate the effect of changing the FAC level. This reinforces the need for studying a number of brands in the action research study, for validity purposes.

Finally, as a limitation, it is also important to note that at this stage of the study, there is still no robust empirical evidence that changing the level of FAC influences NPD management to improve portfolio performance. This theoretical assumption needs to be tested in the planned final empirical study.

PROJECT 3

An Action Research Study

"*If you want to truly understand something, try to change it*"

Kurt Lewin

ABSTRACT

My systematic literature review identified a valuable research question: How does the use of feedforward anticipatory control (FAC) influence new product development (NPD) management teams to improve portfolio value and strategic alignment?

My first empirical study (Project 2) developed two frameworks through empirical study; 1) the FAC Framework and 2) the Portfolio Performance Framework.

These two frameworks are used in this final empirical study for both intervention and to guide data collection. This final project is a longitudinal case action research study. Six intervention cases and three control cases are studied.

Two propositions developed in the first empirical study are tested in this final empirical study:

1) *A change to higher levels of FAC sophistication influences NPD management teams to improve portfolio value.*
2) *A change to higher levels of FAC sophistication influences NPD management teams to improve strategic alignment.*

I find that if a NPD team increases the applied level of FAC sophistication in NPD portfolio product selection the observed outcomes are higher portfolio values and greater strategic alignment.

1 INTRODUCTION

1.1 Background and Rationale for the Project

I discussed in my systematic literature review (Project 1) the business problem driving this overall research study, which is to find better ways to performance manage the product range build activity in the branded footwear and apparel industry. Study of the problem and the systematic literature review identified feedforward anticipatory control (FAC) as a new concept in the management of stage-gate new product development NPD. The systematic literature review results also helped identify a valuable research question: How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment? Finding answers to this question will provide contribution to knowledge of management controls in NPD and also managerial guidance and implications for practice in the product range build activity.

This introduction discusses the findings from the first two projects, the specific purpose of this final empirical study and the structure of this paper.

1.2 Findings From Project 1 and Project 2

My systematic literature review found that there is a scarcity of research in the use of management controls in NPD (Davila, 2000; Bonner et al., 2002; Saunders et al., 2005; Kester et al., 2011). The results show that the use of FAC has an important role in the management of NPD. It was noted that despite the recognized importance of feedforward control in the management of NPD, no specific theoretical or empirical study has been found on the use of the control in NPD. Moreover, during my systematic review of the literature I found no study of how changing the sophistication of management controls in NPD portfolio management influences improvement in portfolio value and strategic alignment.

In the literature I found guidance for the design of empirical studies of NPD and management controls, especially that the focus should be on the stage-gates in the NPD process because these are the critical points more likely to provide greater insight and understanding into improving NPD performance and effectiveness.

My first empirical study (Project 2) established two frameworks that can be used in a longitudinal action research study that measure changes in levels of FAC sophistication and changes in portfolio value. One framework, the FAC Framework was constructed using literature, logic and empirical inductive development. The second framework, the Portfolio Performance Framework, was developed using inductive empirical study.

In the first empirical study I noted that to help NPD managers use FAC and to observe how FAC influences the management of stage-gate NPD requires an action research methodology (Susman and Evered, 1978; Eden and Huxham, 1996). Such an approach is concerned with the 'development of processes which will operationalize frameworks and provide managers with practical approaches to improving their operations' (Platts, 1993). This requires linking the processes to frameworks. This final action research study, using intervention, changing levels of FAC and capturing changes in performance, is the specific purpose for this project and is discussed next.

1.3 Specific Purpose of the Project

The specific purpose of this final empirical project is to observe how FAC influences NPD management teams to improve portfolio value and strategic alignment. Two propositions developed in Project 2 are to be tested in this project to help answer the research question:

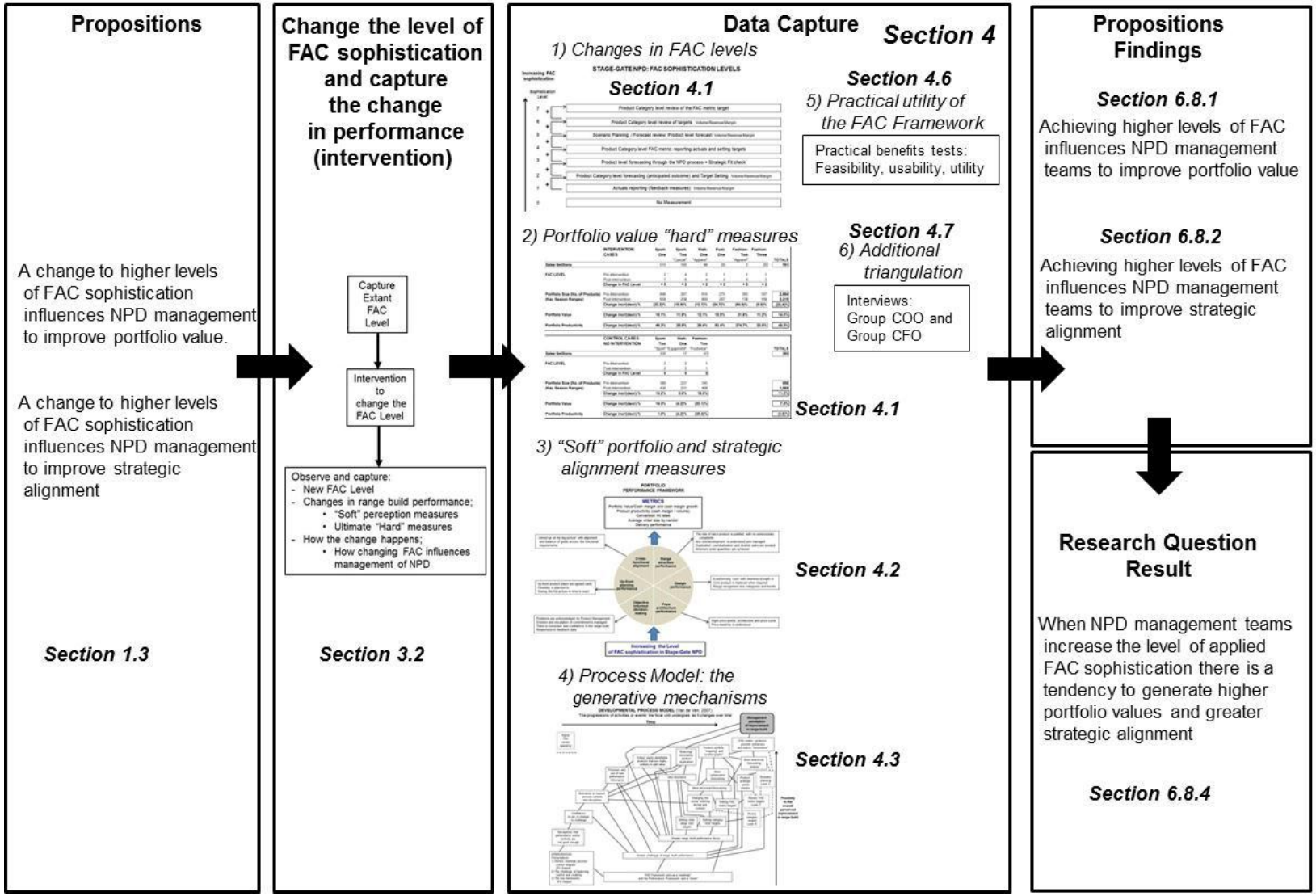
1) *A change to higher levels of FAC sophistication influences NPD management teams to improve portfolio value.*
2) *A change to higher levels of FAC sophistication influences NPD management teams to improve strategic alignment.*

1.4 Structure of the Paper

I have created a diagram to provide a high-level guide to the study, showing the research question, propositions, major research approaches and findings (Figure 32). I next discuss the structure of this paper, referring to this study diagram guide where relevant.

Figure 32 Action Research Study – Diagram Guide

Research Question: How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?



The paper is structured in eight sections. The first section is this introduction which discusses the background and rationale for the project and the specific purpose of this study.

In section two I review the theoretical positioning of the work, placed within management controls systems theory.

Next, in the methodology section, section three, I first consider the selection of action research as the methodology for the study. I also review the planned use of the two frameworks, developed in the first empirical study, in this action research intervention study. The next part of the methodology section reviews the overarching research approach, which includes use of the engaged scholarship model (Van de Ven, 2007), standards for checking the quality of action research (Eden and Huxham, 1996), the components of the design rationale and the research instruments used. I also explain the different methodologies used for measuring portfolio value and strategic alignment.

In the next part of the methodology section I discuss the detailed research design and the design components. Firstly, I describe how I capture changes in FAC levels and changes in portfolio performance, secondly how I develop the process model (Van de Ven, 2007) and thirdly how I assess the practical benefits of the FAC Framework (Platts, 1993). I next consider the measurement of strategic alignment followed by a discussion on the approach to coding. Next I discuss the implications identified in the first empirical study (Project 2) that I need to consider for this action research study. The last part of the methodology section presents the case for rigour, validity and reliability of this study.

The results are presented in section four. The results are presented in seven sections. Firstly the “hard” measures portfolio value and portfolio productivity results are presented (Figure 32, “section 4.1”). Second the soft performance measure results are presented (Figure 32, “section 4.2”) and thirdly the process model is developed (Figure 32, “section 4.3”). Fourthly the management perceptions on the FAC and portfolio value relationship are presented, fifthly the findings on consolidation of FAC levels to achieve higher FAC levels, sixthly the interview results on feasibility, usability and utility of the FAC Framework (Figure 32, “section 4.6”)

and lastly the interview data from the Group COO and Group CFO (Figure 32, “section 4.7”).

Section five discusses the cross-case comparison on moderators not controlled for in the research design.

The findings are discussed and presented in section six. The findings are presented in line with the approaches, discussed above, that have I used to assess the two propositions. First, I review the changes in the levels of FAC sophistication and the observed changes in portfolio performance. Second I discuss the findings of the process model (Van de Ven, 2007). These findings are used to assess the changes in portfolio value and the changes in strategic alignment. Next I review the findings on changes in strategic alignment.

I follow these findings with an assessment of the FAC Framework against the practical benefits tests (Platts, 1993).

The concept of the achievement of higher levels of FAC being contingent on consolidation of the lower levels of FAC is also discussed and the NPD management perception of the utility of the FAC Framework and Metric to “balance” control and NPD experimentation. I also discuss challenges to the practical utility of the FAC Framework.

I next use the findings to assess the two propositions and discuss the contributions to knowledge (Figure 32, “section 6.8”) . I follow this with a discussion on the commercial relevance and impact of the study. The last part of the discussion section is on the limitations of the study.

Section seven is a personal reflection and section eight presents the conclusions.

In the next section I describe the theoretical positioning.

2 THEORETICAL POSITIONING

As noted earlier, the specific purpose of this final empirical study is to observe how FAC influences NPD management teams to improve portfolio value and strategic alignment and to test the two propositions developed in the first empirical project. This study plans to change the level of sophistication of FAC being applied in the

stage-gate NPD process and to capture actual and perceived changes in NPD portfolio performance.

The theoretical positioning of the study is situated in the use of management controls in the performance management of NPD portfolios. This theoretical positioning and how this influences methodological selection is discussed next.

2.1 Theoretical Positioning

The high-level theoretical base is systems and control theory (Weiner, 1950, 1953; Von Bertalanffy, 1950) and at mid-level is in management control systems theory and specifically in the sub-field of the performance management of NPD portfolios. The management controls theoretical foundation is the use of feedforward control within a 'systems feedback loop' (Koontz and Bradspies, 1972; Ishikawa and Smith, 1972).

The research question is "How does the use of FAC influence NPD management teams to improve portfolio value and strategic alignment?" Exploring answers to this question will provide new contribution to knowledge of management controls in NPD.

FAC has a specific role in minimising the difference between planned and actual performance and to improve product selection in NPD portfolios. The control anticipates the need for preventative action that is taken before the difference between planned and actual performance occurs (Ishikawa and Smith, 1972). In theory, FAC has a valuable role in influencing NPD management teams to curb excessive and wasteful product development but not stifle it, assist in achieving strategic alignment, and improve performance, measured by the value delivered from the product portfolio (Peters and Waterman, 1982; Simons, 1994, 1995; Davila, 2000; Bisbe and Otley, 2004; Morris et al., 2006; Richtnér and Åhlström, 2010).

My systematic literature review of management control systems and NPD suggests that feedforward control can help improve NPD performance. However, in my literature review I did not find any study that explains how changing the level of sophistication of feedforward controls in NPD product selection is associated with improvements in portfolio value and strategic alignment.

It appears that little is known about how NPD managers approach the challenge of exercising control, reducing excessive and wasteful NPD outcomes, and simultaneously promote NPD experimentation, to maximise portfolio value (Richtner and Åhlström, 2010; Bisbe and Otley, 2004; Kester et al., 2011; Morris et al., 2006). This is considered an important area for study (Frow et al., 2005). To fill this gap in knowledge recent studies (Kester et al., 2011; Martinsuo and Poskela, 2011) encourage researchers to develop management control frameworks assessing NPD portfolios.

Recently writers in the field have emphasised the need to study short-term and long-term control criteria and to understand the relationship between NPD control systems, portfolio value and strategic alignment (Martinsuo and Poskela, 2011; Kester et al., 2011; Lerch and Spieth, 2012). There was little research on the underlying mechanisms of NPD portfolio control and no research on how changing the sophistication of management controls in NPD portfolio management influences improvement in portfolio value and strategic alignment.

My research study addresses these gaps in knowledge.

The consideration of the theoretical base is an important check in the Eden and Huxham (1996) action research standards (Appendix R), Contention 2:

"Contention"	**The performance of this study compared to the contention "checklist"**
Contention 2 *As well as being usable in everyday life action research demands an explicit concern with theory. This theory will be formed from the characterization or conceptualization of the particular experience in ways which are intended to be meaningful to others.*	This study has an explicit concern with management control systems theory and the application of FAC by NPD management teams.

The theoretical base of FAC in NPD and the requirement to observe changes in FAC and the capture of performance outcomes, to test the two propositions, influences the methodological selection. A methodology is required that can empirically test a

complex theoretical framework, in this study the FAC Framework, carry out intervention, observe how change happens with changes in management controls, capture NPD portfolio performance outcomes and observe the effectiveness of the change. I also plan to capture a rich understanding of the underlying generative mechanisms when NPD teams adopt the changes in control.

These considerations lead me to select action research as the methodology. This methodology selection is considered in more detail in the next section by reviewing action research studies of management controls and also action research as a methodology and why it is a good option for my research.

3 METHODOLOGICAL SELECTION AND RESEARCH DESIGN

In this section I first consider the selection of action research as the study methodology. Initially I assess the methodological selection criteria and discuss how action research meets these requirements. A review of action research management control studies and also action research methodology papers helps clarify the use of the methodology against the methodological selection criteria I have identified.

The intervention approach, to increase the level of FAC sophistication applied in NPD, is relatively “low-level” and involves the sequential presentation of graphical charts and frameworks. Therefore I discuss what is known about using frameworks for intervention.

This study uses action research, multiple methodological lenses and multiple cases. To help explain the various components of the design I next discuss the overall research approach to the study. In this section I review the “meta-level” research design, comprising of the engaged scholarship framework (Van de Ven, 2007), the action research standards tests (Eden and Huxham, 1996), the research design rationale and the research instruments. In the design rationale I present the use of Pettigrew et al.’s framework (1989) capturing context, process and content during intervention, the process model to capture the changes in controls adopted by the NPD teams (Van de Ven, 2007, p148), the practical benefits tests of the FAC Framework (Platts, 1993) and also managements’ perception of the relationship between changes in FAC and changes in portfolio performance. I next note that the research instruments used are interviews, observations, documents, performance

measures and the two frameworks developed in the first empirical study (Project 2). The two frameworks are used to guide data collection.

Having shown this overarching research approach I next discuss the detailed research design. Firstly I discuss the capture of changes in FAC levels of sophistication and changes in portfolio performance. This covers presentation of the unit of analysis, the selected cases, the intervention method, data capture during and post intervention and capture of changes in portfolio values. I next explain the purpose of the process model (Van de Ven, 2007) to capture data on the generative mechanisms of changes in controls. This is followed by a more detailed explanation of the practical benefits tests. I next discuss how I have made strategic alignment as close as possible to being observable in the study. Finally I cover the approach to coding, the implications for this study identified in the previous projects and also the case for reliability and validity.

First, I discuss selecting action research as the study methodology.

3.1 Selecting Action Research as the Methodology

This section considers the choice and advantages of action research as the study methodology and is based on a review of action research literature. The key methodological selection criteria are the requirement to test a complex theoretical framework, carry out interventions, observe how change happens, capture performance outcomes, observe the effectiveness of the change and capture a much better and rich understanding of the underlying generative mechanisms.

First, the use of action research as the methodology in management controls studies is reviewed.

3.1.1 ACTION RESEARCH STUDIES ON MANAGEMENT CONTROLS

This sub-section reviews action research studies on management controls and discusses why it is a useful and valuable approach for management controls longitudinal research. These studies provide evidence that the methodology is relevant and applicable to this research project as a useful and valuable approach for longitudinal study of management controls. The following management controls

studies show that the methodology is useful for intervention and to observe change happening and assessing the effectiveness of that change.

Mirvis and Lawler (1983) implemented performance measurement systems into ten branches of a US bank and also into a manufacturing firm, as “action research” projects. Their research reports on these two field studies where they helped develop, implement, and evaluate the impact of new information systems. It was a longitudinal study where the authors considered themselves part of the “task force”. They found that it was possible to combine financial and non-financial indicators into a “model” of firm effectiveness and assessing the ‘quality of work life’.

Seal et al. (1999) consider that they had “double” roles in their study, as researchers and as participants. They participated as “intermediaries” to ‘analyse the role of management accounting’ in the setting up of a strategic partnership between two UK manufacturing companies. They observed the development of the partnership arrangements and considered that they were ‘well placed to observe and experience’ the ongoing changes taking place. Interestingly they considered the action research standards of Eden and Huxham (1996) when justifying the quality of their action research. The authors noted i) it was a matter of genuine concern to management and ii) insights were gained that would not have been possible through other methods.

Action research has also been used to develop a design audit tool to increase practitioner understanding of the significance of good design issues and promote practice improvements in SMEs (Moultrie et al., 2007). The audit tool was applied, using action research, in three companies. As part of the study, during intervention, there was observation of design practice.

The methodology has been used in a study of a performance measurement system in a Chinese state-owned enterprise, where the researchers participated in the design process (Li and Tang, 2009). The authors describe the ‘unique opportunity to experience and closely observe how change happened’ and how the methodology can help focus on identifying whether the change is effective. The study found that the performance measurement system has been used as a “symbol” to engage management attention and influence decision-making. The paper quotes Rapoport (1970, p.499); ‘action research aims to contribute both to the practical concerns of

people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable framework'.

Chung and Windsor (2012) have recently used participatory action research (PAR) to share elementary financial and accounting knowledge with a church community in North Western Kenya. The purpose of the study was to share knowledge about accounting, internal controls and financial management and to assist local understanding of the importance of "financial integrity" to help improve their social situation. The local participants were described as 'poor and powerless', though 'eager to learn, responding enthusiastically'. The authors found the PAR methodology 'cyclical' with iterative stages of planning, doing, observing and reflecting.

These studies, using action research methodology, show that it can be a useful and valuable approach for management controls longitudinal research. A key conclusion from all these studies is that the methodology can be used to intervene in selected cases, observe change happening and assess the effectiveness of that change. These are objectives I want to achieve from this study.

These papers are examples of studies using action research. It is also useful to review methodology studies that can support the rationale for use of action research in this study.

3.1.2 ACTION RESEARCH METHODOLOGY STUDIES

There are a number of studies on action research as a methodology that provide both guidance and validation of methodological selection.

Like the management controls studies above, they note the value of action research in carrying out interventions, observing how change happens, capturing the outcomes of the intervention and observing the effectiveness of the change. These studies also discuss how the methodology enables testing of complex theoretical frameworks that help develop and elaborate theory generating knowledge-for-action from practice.

Solving complex field problems that are relevant to practitioners and academia, using action research, involving 'intense researcher-practitioner collaboration', helps

bridge the “relevance gap” (van Aken, 2005). The key objective is to design solutions to practitioner field problems. Van Aken argues that the outputs of academic applied management research would be enhanced if solution-oriented knowledge was included. She also discusses the “technological rule” that links a certain intervention to a certain outcome and describes it as a “design proposition”. A design proposition requires three components; a dependent variable of value to the organization, an independent variable that can be changed and thirdly a proposition tested in the field. It is this approach, through action research, that gives grounding and evidence to applying the technological rule for specific interventions in specific contexts. This also signifies the difference between knowledge-for-understanding and knowledge-for-action (Argyris, 1993).

I understand that knowledge-for-action and closing the relevance gap are two key objectives of the Cranfield DBA.

Van Aken (2005) describes designing solutions to field problems as a “design science”, similar to medicine and engineering. A more recent study also discusses management research as a design science with the aim of closing the relevance gap (Pandza and Thorpe, 2010). The paper defines “deterministic design” which is principally a problem-solving undertaking that finds an optimal design result. The importance of deterministic design in management research is noted, where, through interventions, deductively or inductively developed from the collective body of existing knowledge, new knowledge can be obtained in actual organizational contexts.

With action research the researcher ‘imposes a conceptual framework on the tasks’ of an activity with the purpose of changing the approach and observing the effects (Platts, 1993). The broad characteristics of action research are that it is research in action, rather than about action, it is participative, concurrent (building up scientific knowledge) with action and is an application of the scientific method to solve practical problems (Coughlan and Coghlan, 2002). As a method and approach for knowledge generation, action research has ‘far greater potential than positivist science’ to understand and manage organizational matters (Susman and Evered, 1978).

Susman and Evered (1978) also identify six characteristics of action research as a ‘corrective to the deficiencies of positivist science’; it is future oriented, collaborative, implies system development, generates theory grounded in action, is agnostic (‘subject to re-examination and reformulation’) and is situational (can change as situations change).

An additional and ‘exceptional’ advantage of action research is the triangulation opportunities (Eden and Huxham, 1996), between observation of interventions and their impact, between participant accounts and how those accounts change during the longitudinal study. These are advantages taken in the research design for this study.

A review of these studies provides validation for the use of action research as the methodology for this project. The value and relevance of action research is in carrying out interventions, observing how change happens, capturing outcomes and observing the effectiveness of the change. Also the methodology enables testing of complex theoretical frameworks, developing and elaborating theory from practice. Therefore the resultant output is theory generating knowledge-for-action and can help bridge the relevance gap between academia and practice.

In addition, I believe that you can only truly observe the characteristics of a control system if the control system is in operation. If the control system is not operating, it is like a radiator with a stuck valve. Most of the cases at pre-intervention were at low levels of FAC sophistication, levels 1 or 2, like “stuck valves” all at the same relatively low level. Also in the first empirical study I observed that NPD teams that apply higher levels of feedforward control sophistication have higher portfolio values and greater strategic alignment. This finding is also an influential prompt to my selection of longitudinal action research for the final empirical study. Longitudinal case action research can also give a richer understanding of the underlying generative mechanisms. Quoting Kurt Lewin; ‘if you want truly to understand something, try to change it’. Therefore I select longitudinal case action research for the final empirical study.

The consideration of justifying the use of action research is an important check in the Eden and Huxham (1996) action research standards (Appendix R), Contention 10:

"Contention"	**The performance of this study compared to the contention "checklist"**
Contention 10 *In order to justify the use of action research rather than other approaches, the reflection and data collection process – and hence the emergent theories – should be focused on the aspects that cannot be captured easily by other approaches. This in turn, suggests that having the knowledge about, and skills to apply, method and analysis procedures for collecting and exploring rich data is essential.*	The use of action research as the project methodology has been considered. Changing levels of FAC and capturing changes in performance can be achieved by intervention and longitudinal qualitative study. I have the knowledge and skills to apply the data collection and analysis procedures: engineering and process knowledge, management accountant, researcher, NPD practitioner, context experience and consultant.

Before describing the detail of how action research methodology has been applied to this project, the use of Frameworks as an intervention in action research needs to be discussed, in the next sub-section.

3.1.3 PRESENTATION OF FRAMEWORKS AS INTERVENTIONS IN ACTION RESEARCH

The detailed research design section, in the next section, explains that the intervention in this action research project uses the presentation of models, charts and frameworks. Firstly a model that shows the stage-gate review meeting as a control system, secondly a chart is used to help communicate the idea of "balancing control and creativity", as noted in my systematic literature review, and finally the two resultant frameworks from my first empirical study (Figures 34 and 35) to present the idea of changing the levels of FAC and how it could influence the management and performance of the NPD portfolio.

This approach raises the methodological question of whether presentations of frameworks can constitute an "intervention" in an action research study. Guidance comes from the key action research study of Susman and Evered (1978) who state:

'Interventions are acts of communication between two or more self-reflecting subjects, requiring mutual understanding of the meaning of the acts and common

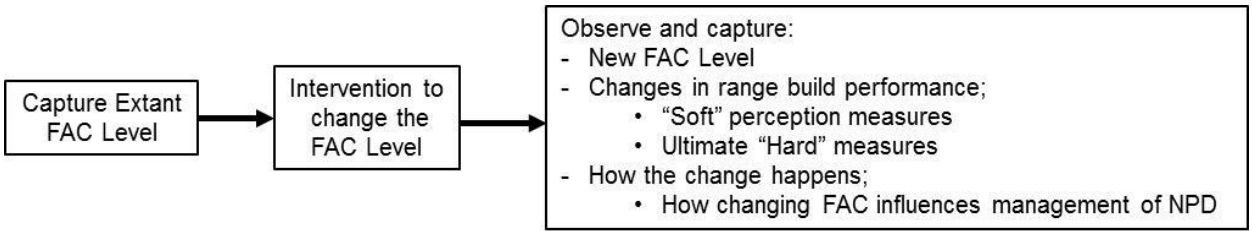
consent as to their presumed consequences. Such interventions have an element of surprise or unexpectedness to them so that they are unlike other actions routinely undertaken within the organization. .....The element of surprise evoked by an intervention results when the change agent offers members of the target organization a new way to conceptualize an old problem and offers it in a language or framework that differs from that by which members of the organization define their present situation.'

Therefore this guidance supports the use of the presentation of frameworks as an "intervention" in an action research study, where the frameworks offer a new way of conceptualizing 'an old problem' and in a way that is different from current routine actions and the extant management definition of the situation.

3.2 HIGH-LEVEL INTERVENTION METHODOLOGY AND THE DEVELOPED FRAMEWORKS

This project is a longitudinal field study that intervenes and changes the level of FAC sophistication in multiple examples of the unit of analysis and captures changes in NPD portfolio performance. This action research methodology is presented in Figure 33.

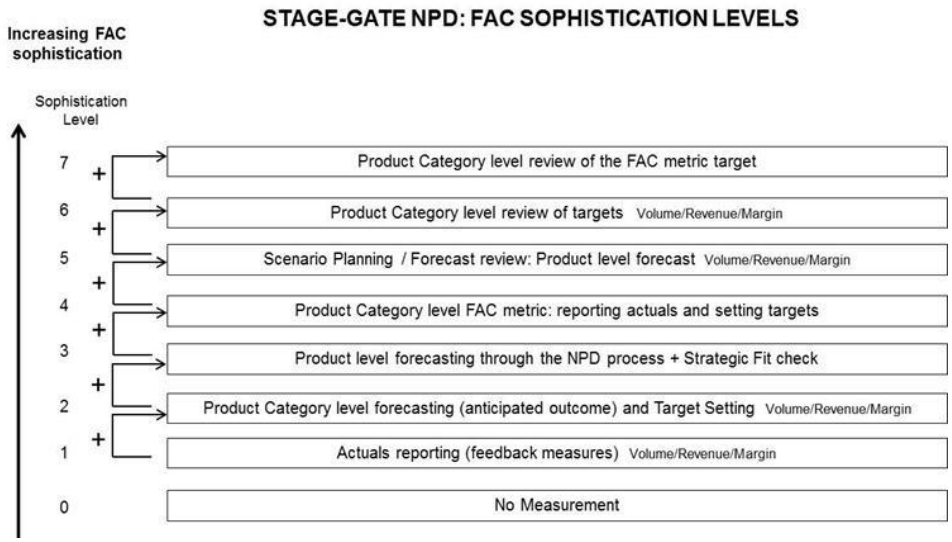
Figure 33 Action Research Methodology – Project 3



Action research, with intervention, is used to change the level of FAC, from the extant level of FAC to the post-intervention FAC level. The methodology is to observe and capture changes in FAC levels, changes in performance and observe how the change happens. Observing how the change happens can show how changing the FAC levels of sophistication influences NPD management to improve portfolio value and strategic alignment.

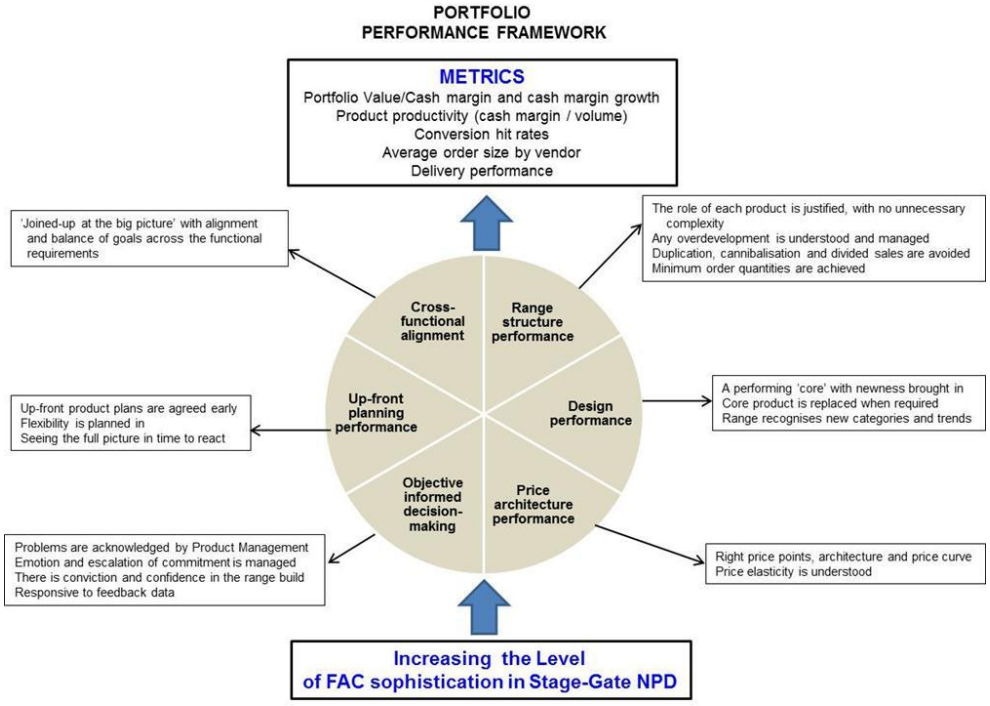
To observe and capture the change in FAC levels requires the use of the FAC Framework developed in the first empirical study (Figure 34). There are eight FAC levels that can be used to capture the pre- and post- intervention FAC levels.

Figure 34 FAC Framework



To observe and capture changes in performance, of both soft and hard measures, requires the use of the Portfolio Performance Framework developed in the first empirical study (Figure 35). There are six soft perception measures of performance and the ultimate hard metrics of cash margin and cash margin per product.

Figure 35 Portfolio Performance Framework



These two frameworks (Figures 34 and 35), developed in the first empirical study will support the intervention and data collection in this action research study.

The next section discusses the overarching research methodology for the study.

3.3 Overarching Research Approach

This section discusses the overarching research approach for the study. The components of the overarching methodology are the positioning of this phase of the overall DBA study, the meta-level research design, the research design rationale and the research instruments used in the project (Figure 36). This project is the last research phase of my DBA study before completing the thesis, with a document that links the three projects, systematic literature review (Project 1), first empirical study (Project 2) and this action research study (Project 3).

Each of the components is now discussed in more detail. Firstly the meta-level research design is discussed.

3.3.1 META-LEVEL RESEARCH DESIGN

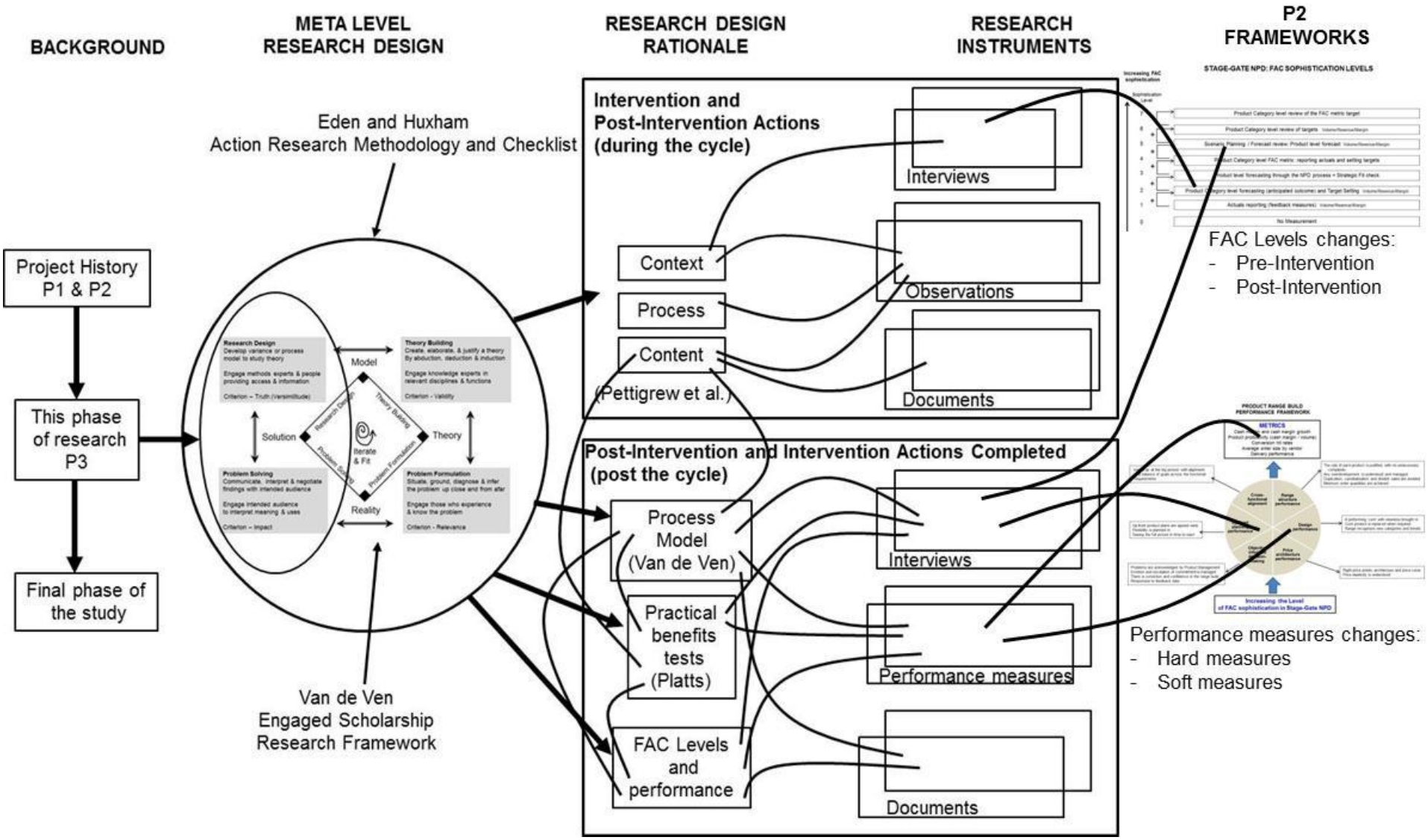
This subsection discusses the two components of the meta-level research design, firstly the engaged scholarship research framework of Van de Ven (2007) and secondly the Eden and Huxham action research methodology checklist (1996).

3.3.1.1 Engaged Scholarship Research Framework (Van de Ven, 2007)

The meta-level research approach uses Van de Ven's (2007) engaged scholarship research framework. There are four activities involved in an engaged scholarship research project (Van de Ven, 2007 p29):

1) Problem formulation – a real world grounding of the research problem and question
2) Theory building – developing a conceptual model or framework that addresses the problem, for that particular context
3) Research design and conduct – empirical study using the model or framework, that addresses the research question
4) Problem solving – apply the findings to solve the research question 'about the problem existing in reality'.

Figure 36 Overarching Research Approach



The approach taken for this overall study, following the engaged scholarship framework, is firstly identifying the NPD portfolio performance issue, the business problem situated in reality, elaborating theory to create the FAC Framework, next testing the FAC Framework and finally assessing whether the problem has been solved. This final phase of my research study involves the final two steps of the engaged scholarship research project, the empirical study using the developed framework and applying the findings to try and answer the research question.

With the third activity in the engaged scholarship research project, the research design and conduct, Van de Ven describes two basic operational empirical research models, the variance model and the process model. The first model, a variance model, addresses the antecedents or consequences of the research question being studied. The second model, a process model, explains how a sequence of events leads to some outcomes. The latter operational research model is therefore used in this study to help explain how changing FAC influences NPD management teams in the adoption of control changes to improve portfolio performance.

The use of this model is shown in Figure 36 in the post-intervention, post cycle, research design rationale. The approach to using the process model is described in more detail in the methodology section.

3.3.1.2 Action Research Standards (Eden and Huxham, 1996)

Action research is the chosen methodology for this project. The Eden and Huxham (1996) study provides a standards checklist for assessing good action research and is therefore a valuable checklist for this study.

The purpose of the Eden and Huxham paper is to gain a clear understanding of what is required to achieve ‘good quality’ action research. The authors note that interventions provide exemplary opportunity for experimentation where ‘complex theoretical frameworks’ can be tried out and tested. They argue that the value of action research is in theory development and elaboration from practice intervention. This also makes the research output more relevant and persuasive for both practitioners and academia. They also note the use of other research methodologies where the subjects ‘do not have to commit to real action’ nor live with the

consequences, are viewed as unreliable methodologies. Action research is considered to counter this unreliability.

The output of the Eden and Huxham (1996) paper is a set of standards, or 12 ‘contentions’ for assessing the quality of good action research. I have compared the performance of my study against the contentions checklist (Appendix R). The comparison against the checklist suggests that this study meets the standards of ‘good action research’. This is a valuable meta-level research design standards checklist that supports rigour and reliability. The performance of this study, against the Eden and Huxham action research standards checklist, is referred to, where relevant, in the paper.

The next sub-section discusses the research design rationale for capturing the outcomes of the study.

3.3.2 RESEARCH DESIGN RATIONALE

There are four key components to the research design rationale (Figure 36).

Firstly there is the methodology used for data collection at intervention and in the following actions, post intervention, during the cycle of research, from one key NPD portfolio to the next comparative NPD portfolio, until the completion of the post intervention actions. The methodology uses the Pettigrew et al. framework (1989); capturing context, process and content. The protocol is discussed in the methodology section.

The second component, the process model, has been noted earlier and ‘explains how a sequence of events leads to some outcome’ (Van de Ven, 2007 p148). The focus of such a model is on the progressions of events or activities that the organization goes through as it changes over time and can be presented with ‘visual mapping’ (Van de Ven, 2007 p220). The model is used in this study to help explain how changing the level of FAC sophistication influences NPD management teams.

The third component is managements’ perception of the relationship between changing FAC levels of sophistication and changes in portfolio performance. Understanding this outcome is at the core of the overall study research question on how FAC influences NPD management teams in improving portfolio value.

The final component is the application of Platt's three practical benefits tests. The criteria selected for assessing the practical benefits of the FAC Framework are (Platts, 1993):

- Feasibility; can the framework be used
- Usability; how easily the framework can be used
- Utility; the usefulness of the framework.

The design provides a number of data sources for assessment of these practical benefits tests:

- Management perception of the relationship between FAC and portfolio value
- Actual changes in portfolio performance
- The process model (Van de Ven, 2007 p199), the changes made to the range build activity and stage-gate NPD process
- Managements' perception of the feasibility, usability and utility of the FAC Framework.

3.3.3 RESEARCH INSTRUMENTS

The design uses four research instruments (Figure 36); interviews, observations, documents and performance measures. The design also uses the two frameworks, the FAC Framework and the Portfolio Performance Framework, developed in the first empirical study (Project 2), to guide data collection (Figure 36).

Firstly, at intervention, and in the cycle of actions following intervention, the study uses interviews to capture managements' "self-assessment" of the pre-intervention FAC level. The FAC Framework is used to guide data collection. Interviews are also used post the intervention and after all the intervention actions are completed, to capture managements' "self-assessment" of changes to the FAC level, changes in controls and the perception of changes in performance (Figure 36).

Observation is used at intervention and in the actions following intervention to capture management response. This includes how the FAC Framework is used by management in making changes to controls in the NPD process.

Documents provide data of the changes made by management to NPD process controls.

Finally, hard and soft portfolio performance changes are captured using the Portfolio Performance Framework. This provides data for the assessment of changes in FAC levels and performance and the practical benefits tests.

The results of this action research study can show how FAC influences NPD management teams and whether the FAC Framework has feasibility, usability and utility.

3.3.4 MEASUREMENT OF PORTFOLIO VALUE AND STRATEGIC ALIGNMENT

In the study, the measurement of portfolio value is captured differently from the measurement of strategic alignment. I now explain which of the methodologies are used to capture data for measuring each of these concepts. Portfolio performance, portfolio value and portfolio productivity are measured in both hard and soft measures. I have made strategic alignment as close as possible to being observable using soft perception measures (Table 11).

Product range realised cash margin is a proxy for portfolio value. Hereafter I will use the term portfolio value.

TABLE 11 Measurement of Portfolio Value and Strategic Alignment

PORTFOLIO VALUE

Methodology/Data Capture	Measurement
Portfolio performance framework	Portfolio value (Product range realised cash margin) – “hard” measures
	Portfolio productivity (Realised cash margin per product) – “hard” measures
	Soft perception measures - categorizations: range structure performance; design performance; price architecture performance; objective-informed decision-making; up-front planning performance; cross-functional alignment

FAC Levels and performance	Management perception of an improvement in portfolio value with higher levels of FAC sophistication

STRATEGIC ALIGNMENT

Methodology/Data Capture	**Measurement**
Portfolio performance framework	Strategic alignment (performance categorization: cross-functional alignment)
Process model	Observe changes in controls that improve strategic alignment

Next I assess the presentation of the overarching research approach against the action research standards checklist (Eden and Huxham, 1996)

3.3.5 ACTION RESEARCH STANDARDS – OVERARCHING APPROACH

The consideration of a high degree of method and orderliness is an important check in the Eden and Huxham (1996) action research standards (Appendix R), Contention 7:

"Contention"	**The performance of this study compared to the contention "checklist"**
Contention 7 *A high degree of method and orderliness is required in reflecting about, and holding on to, the emerging research content of each episode of involvement in the organization.*	Each intervention and subsequent involvement is captured for participation, context, process and content (Pettigrew et al., 1989). The "developmental process model" (Van de Ven, 2007) is a research output from capturing the intervention events and results. A high degree of "method and orderliness" is applied throughout the study.

I now discuss the detailed research design used for this study; the capture of changes in FAC levels of sophistication and changes in portfolio performance, the

purpose of the process model (Van de Ven, 2007) to capture data on the generative mechanisms of changes in controls and a more detailed explanation of the practical benefits tests. I also cover the approach to coding.

3.4 Detailed Research Design

This section discusses the detailed research design, describing the methodology for exploring the changing of FAC levels and capturing changes in performance, the construction of a process model (Van de Ven, 2007) that captures how the change happens and thirdly the method for assessing the FAC Framework against the three practical benefits tests (Platts, 1993).

These three research design components will be used to present the findings that provide evidence for assessing the two propositions.

This section also discusses the approach to coding and the implications identified in the first empirical study that need to be considered in this project. The final part of this detailed research design section considers rigour and reliability and how this is achieved through the use of the different methodological lenses, the use of data triangulation and the use of action research quality standards (Eden and Huxham, 1996).

Firstly, the detailed research design for exploring the changing of FAC levels and capturing changes in performance is discussed.

3.4.1 FAC LEVELS AND PERFORMANCE

This section discusses and describes the detailed research design and methodology exploring the changing of FAC levels and changes in NPD portfolio performance. The elements of the detailed design discussed in this section are the unit of analysis, contextual information on the cases selected, the intervention method of frameworks and graphics, the capture of data at intervention and post-intervention, the capture of hard and soft measures data, additional triangulation interviews, documents used and the action research reliability check against the Eden and Huxham (1996) contentions.

First, the unit of analysis is considered and discussed.

3.4.1.1 Unit of Analysis

The unit of analysis is the NPD management team. These teams are separate and self-contained units that build NPD portfolios. This section explains the reasons for selecting this unit of analysis. Hereafter, this unit of analysis will be referred to as the "NPD team".

A conclusion from my first empirical study was that the selection of a unit of analysis in the branded footwear and apparel industry is likely to achieve the required design and methodological requirements. The key considerations being:

- longitudinal observation with capture of performance data
- the DBA timeline
- a stage-gate NPD process with a relatively fast NPD cycle time
- intervention at a level of unit of analysis where the changes in NPD controls and NPD portfolio performance can be studied distinctly from other cases
- the ability to observe the changes caused by the intervention, irrespective of business characteristics such as product and category types, price positioning, number of markets of sale, gender specific product
- intervention with multiple examples of the unit of analysis for reliability and validity.

In deciding the unit of analysis it is useful to consider the level of analysis and the level of measurement for the 'focal unit', the identified 'level of reference', where any potential generalization is at the focal unit level (Rousseau, 1985). The level of analysis being the unit 'to which the data is assigned' for testing and analysis and the level of measurement applies to the unit to which the data 'are directly attached'. The level of measurement is the performance of the NPD portfolio that the team are managing. The project is planned to capture this performance with both "hard" and "soft" metrics.

In this project the core focal unit, the level of analysis, and for each selected case, is the NPD management team that is managing the NPD portfolio and the NPD process. Such a NPD management team typically consists of the roles of Category Manager, Product Manager or Design Manager, Product Developer, Supply Chain

Manager and Business Analyst (role definitions - Appendix M). The measurement of portfolio value is therefore aligned to the level of analysis, the NPD team.

Also, product selection is a result of cross-functional input and involvement. This cross-functional involvement is significantly related to NPD performance (Davila, 2000). Therefore using the NPD team as the unit of analysis can provide a richer understanding of the generative mechanisms.

Any potential generalization of an intervention, using the FAC Framework, would be at this 'focal unit' level.

Eight cases were studied in my first empirical study (Project 2), all businesses operating within the Group organization where I work. The NPD team cases for this study have been selected from these subsidiary businesses, and are being studied as multiple examples of the unit of analysis within the same organization. The research design is to use multiple examples of the unit of analysis within the same organization (Yin, 2009; Bourne et al., 2005).

The consideration of potential generalization and the research context are important checks in the Eden and Huxham (1996) action research standards (Appendix R), Contentions 1, 5 and 12:

"Contention"	**The performance of this study compared to the contention "checklist"**
Contention 1 *Action research must have some implications beyond those required for action or generation of knowledge in the domain of the project. It must be possible to envisage talking about the theories developed in relation to other situations. Thus it must be clear that the results could inform other contexts, at least in the sense of suggesting areas for consideration.*	This study and theory development could inform commercial organizations managing large portfolios of products through stage-gate NPD.
Contention 5 *Theory building, as a result of action research, will be incremental, moving from the particular to the general in small steps.*	The "particular" is the action research in the branded footwear and apparel industry. The "general" is moving the argument to commercial organisations

	managing large portfolios of products through stage-gate NPD.
Contention 12 *The history and context for the intervention must be taken as critical to the interpretation of the likely range of validity and applicability of the results.*	The industry context, the unit of analysis, the NPD process and the interventions have been described in the study. The research design has also controlled for most of the P1 literature identified moderators.

Each unit of analysis within the single organization can be considered as a selected case. I selected six cases for intervention and three control cases in the study. The contextual characteristics of the selected cases are described next.

3.4.1.2 Cases Selected

This sub-section provides contextual information on the selected cases describing the product categories sold, the age of the subsidiary, time within the Group, subsidiary revenue, the number of countries of sale and the number of employees.

Table 12 Subsidiary Businesses Studied – Contextual Information

a) Intervention cases

Cases	Product Categories	Age of Brand (years)	Years within the Group	Total Sales $m	Separate self-contained NPD Team	Range Sales $m	Number of countries product is sold in	Number of employees
Sport-One	Sports; apparel, equipment	>50	>20	515			>150	220
Sport-Two	Footwear	>50	>10	440	"Casual"	105	>140	208
Walk-One	Outdoor; apparel, equipment	>40	>10	115	"Apparel"	98	28	175
Foot-One	Footwear	>40	>20	20			2	15
Fashion-Two	Apparel, footwear	>20	>5	44	"Apparel"	3	30	38
Fashion-Three	Footwear	>20	>10	20			8	18

Note: Foot-One and Fashion-Three also share a "back-office" of 16 people, in addition to the numbers in the schedule.

b) Control cases: Control Cases – No intervention carried out

Cases	Age of Brand (years)	Years within the Group	Total Sales $m	Separate self-contained NPD team	Product Range Sales $m
Sport-Two	>50	>10	440	"Sport"	335
Walk-One	>40	>10	115	"Equipment"	17
Fashion-Two	>20	>5	44	"Footwear"	41

Six NPD teams in the Brands Group were studied in this project (Table 12). The Group is head-quartered in Europe. Sport-One and Sport-Two were the two largest businesses by revenue, both operating in the sports sector. Sport-One is an apparel and equipment business, whereas Sport-Two only sells footwear. Both businesses sell product in over 140 countries around the world and are two of the oldest sports companies, both over 50 years old. The next largest business, Walk-One, operates in the outdoor market, with apparel being the biggest product category. Walk-One is focused on new market growth, especially in Europe and Asia. The company is over 40 years old.

Sport-Two and Walk-One have both been in the Brands Group for over ten years, whereas Sport-One has been in the Group for over twenty years. Foot-One is a "national" footwear business that sells casual fashion footwear. Fashion-Two and Fashion-Three sell fashion product. Fashion-Two sells apparel and footwear and Fashion-Three sells only footwear. These businesses are relatively younger, compared to the other five, and have been in the Group the shortest period of time. Foot-One and Fashion-Three are the smallest businesses by sales revenue.

The combined sales of the businesses in this study are $1.15 billion and the businesses employ a total of 690 people (Table 12).

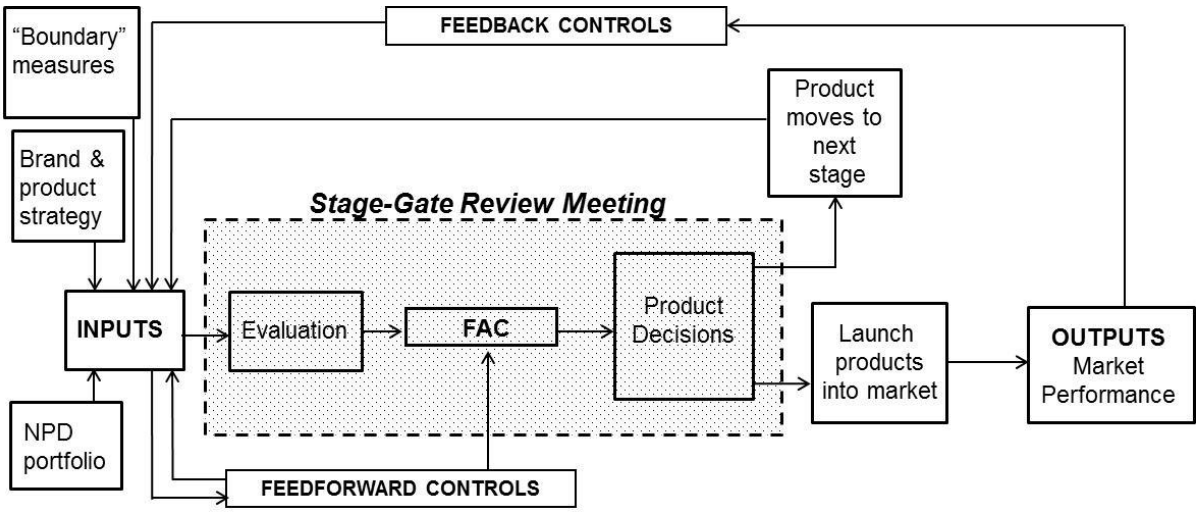
Six "NPD Team" cases were selected in Project 3 from the businesses studied in my first empirical study (Project 2). All the Project 2 businesses wanted to participate in the final intervention project but during this study period one business underwent a significant organizational restructure and another was sold off.

3.4.1.3 Intervention Method

The intervention involved the presentation of four graphical charts. The presentation was conducted in the same way and order of graphics for all the intervention cases. I have described an example of one of the interventions (Appendix FF).

This section discusses the four graphics used in the intervention and their purpose. The reason for the particular order of presentation in the intervention is also discussed. The first graphic presented in intervention was the stage-gate product review meeting represented as a control system.

Figure 37 Stage-gate Review Meetings Presented as a Control System



To prepare "the ground" for explaining the FAC Framework in the intervention first required helping management consider the stage-gate review process as a control system. Therefore the first intervention graphic presented to management was a simplified version of the graphical synthesis output of the systematic literature review (Project 1) (Figure 39) showing the inputs, outputs and control loops in the system. This graphic also presents the location and role of FAC in the system (Figure 37).

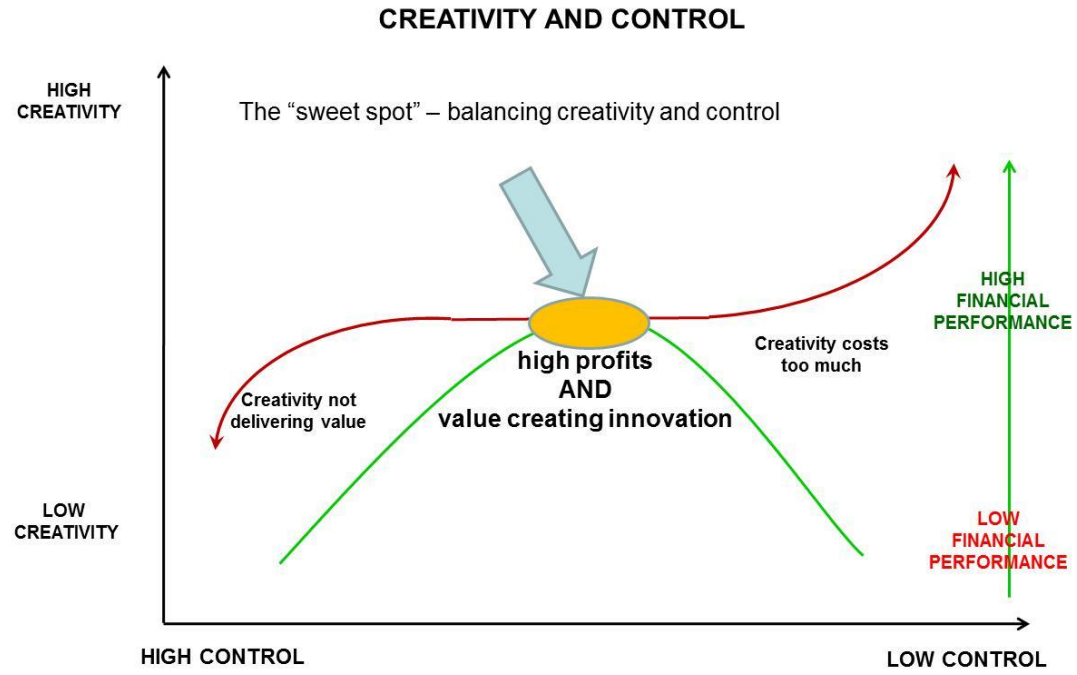
The next graphic used in the intervention presents the concept of "balancing" control and creativity, a challenge in NPD portfolio management, identified and discussed in both the systematic literature review and in the first empirical study (Project 2).

In my systematic literature review I found that a "balance" is required between control and creativity to maximise product innovation and firm performance (Peters

and Waterman 1982, 318; Cowen and Middaugh 1988; Simons 1994; Bisbe and Otley 2004). Therefore this “balance” is an important concept to present to management, during the intervention, to help position the crucial role of FAC in helping find the “sweet spot” where creativity and control are in balance.

Therefore Figure 38, developed from the findings of the systematic literature review, was the second graphic presented to management in the intervention.

Figure 38 Balancing Creativity and Control



The final graphical charts presented in the intervention were the output from the first empirical study (Project 2), the FAC Framework and the Portfolio Performance Framework (Figures 34 and 35).

In the intervention the FAC Framework presents the idea of different levels of FAC sophistication and the Portfolio Performance Framework presents the idea that “hard” and “soft” measures of NPD portfolio performance can be captured whilst observing changes in the level of FAC sophistication.

The FAC Framework represents the type of intervention described by Susman and Evered (1978), discussed in the earlier section on presentation of frameworks as an intervention, that is ‘a new way to conceptualize an old problem’ invoking the ‘element of surprise’ because it differs from the existing management understanding of the situation.

These four graphics were presented in the same way and order in each intervention case.

The next section presents detail on the intervention actions taken across the six cases.

3.4.1.4 Intervention Actions

The intervention actions took place in the six cases across a period of 45 weeks. This section presents detail of the number of intervention actions and the cycle period of intervention actions, by case. This detail presented includes the number of intervention participants in those cases and their respective roles in the focal unit. As noted earlier, six NPD teams cases were selected from the original eight businesses studied in my first empirical study.

The intervention approach has been described in detail in the previous section. In all cases additional intervention action took place. This additional intervention took three key formats. Firstly additional meetings took place in all cases to help management further consider how to operationalize the planned improvement in the use of FAC. Secondly I provided support to create new performance information and analytics used in the stage-gate review meetings. This applied to all cases except Foot-One. Thirdly I provided facilitation in stage-gate review meetings to operationalize the improvement in FAC, as discussed with the NPD management. This took place in only two cases, the smaller businesses, Fashion-Two and Fashion-Three.

Examples of the new performance information and analytics, jointly created between researcher and NPD management, are presented in the results (Figures 44, 52, 57, 58, 59, 62).

During intervention the protocol used (Appendix U) is based on Pettigrew et al.’s framework (1989) which captures context, process and content. At intervention, case

participants were asked what FAC level they currently assessed to be at. This is the pre-intervention FAC level for each case reported in the results.

An analysis of the intervention actions by case is presented in Table 13. The schedule shows the number of intervention actions that took place, by case, and the total number of weeks from the first intervention action to the last.

The number of participants, by case, by intervention action, and their respective roles is also shown in the summary. The final column notes, for each case, the number of weeks taken for “idea to launch”, that is the total NPD process time. Foot-One and Fashion-Three take the shortest time, 26 weeks. Walk-One takes the longest at 56 weeks.

37 intervention actions were carried out across the six cases, involving 30 participants. The shortest intervention action period was with Foot-One, over a period of four weeks and the longest with Sport-One, the first intervention case, with 42 weeks. Of the final, post intervention, post cycle, semi-structured interviews, 12 were carried out with intervention participants, representing 40% of the total intervention participants. The initial intervention method was the same in all the cases.

This section provided details on the intervention actions that took place in the study. The next section discusses how the portfolio value hard metrics were obtained.

3.4.1.5 Capture of “Hard” Metrics

This section describes the methodology for collection of the hard metrics data, portfolio value and portfolio productivity, the metrics identified at the top of the Portfolio Performance Framework (Figure 35).

These measures provide evidence of changes in the FAC level post intervention and changes in NPD portfolio performance. If management perceive that a change in FAC levels has had an effect on portfolio value, it can provide supporting evidence for assessing the first proposition being tested in this study.

TABLE 13 INTERVENTION ACTIONS SUMMARY

CASE	INTERVENTION ACTION NUMBER	P3 INTERVENTION PROJECT WEEK	TOTAL NUMBER OF WEEKS OF INTERVENTION ACTION	NUMBER OF PARTICIPANTS IN THE ACTION	INTERVENTION ACTION PARTICIPANTS; BY ROLE	NUMBER OF SPECIFIC INDIVIDUALS PARTICIPATING	"IDEA TO LAUNCH" LEAD-TIME [WEEKS]
SPORT-ONE	1	1		3	VP Product and Marketing, Chief Operating Officer, Head of Category Strategy & Planning	3	45 Weeks
	2	5		1	Head of Category Strategy & Planning		
	3	14		2	Head of Category Strategy & Planning, Business Analyst		
	4	15		2	Supply Chain Manager, Supply Chain Team Leader	2	
	5	17		1	Supply Chain Team Leader		
	6	20		1	Business Analyst	1	
	7	30		1	Supply Chain Team Leader		
	8	36		1	Supply Chain Team Leader		
	9	38		1	Category Manager	1	
	10	40		1	Brand President	1	
	11	42		1	Head of Category Strategy & Planning		
	11		**42**			**8**	
SPORT-TWO	1	34		2	Product Director - Casual, Category Manager - Casual	2	37 Weeks
"CASUAL"	2	34		1	Business Analyst	1	
	3	44		1	Business Analyst		
	4	45		2	Product Director - Casual, Business Analyst		
	4		**11**			**3**	
WALK-ONE	1	10		1	Product Manager - Apparel	1	56 Weeks
"APPAREL"	2	30		1	Product Manager - Apparel		
	3	32		1	Finance Director	1	
	4	34		2	Category Manager - Apparel, Supply Chain Manager	2	
	5	38		1	Chief Operating Officer	1	
	6	41		1	Category Manager - Apparel		
	6		**31**			**5**	
FOOT-ONE	1	38		1	Managing Director	1	26 Weeks
	2	42		1	Category Manager	1	
	2		**4**			**2**	
FASHION-TWO	1	18		4	Managing Director, Finance Director, Sales Director, Product Director - Apparel	4	36 Weeks
"APPAREL"	2	22		4	Finance Director, Sales Director, Product Director - Apparel, Product Manager - Apparel	1	
	3	25		1	Product Director - Apparel		
	4	25		2	Product Manager - Apparel, Designer - Apparel	1	
	5	35		1	Product Director - Apparel		
	6	42		1	Managing Director		
	7	43		3	Product Director - Apparel, Product Manager - Apparel, Assistant Product Manager - Apparel	1	
	7		**25**			**7**	
FASHION-THREE	1	22		1	Managing Director	1	26 Weeks
	2	22		1	Design Manager	1	
	3	22		1	Head of Sales	1	
	4	24		5	Managing Director, Head of Sales, Design Manager, Head of Marketing, Supply Chain Manager	2	
	5	31		1	Supply Chain Manager		
	6	38		1	Managing Director		
	7	43		1	Supply Chain Manager		
	7		**21**			**5**	
TOTALS	**37**					**30**	

In my first empirical study I found that when sense-checking the FAC Framework with management, they were, unprompted, able to easily and willingly identify the FAC sophistication level for their business. This evidence supports the tests of feasibility and usability. To provide further evidential support of practical utility in this action research study, the reported changes in FAC levels in the intervention cases has been self-assessed by the NPD management team and not by the researcher. In the protocol used in the post intervention semi-structured interviews (Appendix V), informants were asked “What FAC level were you at a year ago? Where are you now?” These findings are presented in the portfolio performance results in this study (Table 15).

With the three control cases, where there was no intervention, the researcher assessed whether there were any changes in FAC sophistication levels over the study period. The concept of FAC and the FAC Framework was not shared with management in the control cases.

The NPD portfolio performance data was obtained from each case Finance department. All the cases use the same group Management Information System, the Enterprise Resource Planning system SAP. The data was extracted from the SAP Business Warehousing software. The data was extracted for the key season pre-intervention and the comparative key season post-intervention. Therefore, given the industry context, there was a year that separated the pre- and post- NPD portfolio data.

The data extracted for each case was; the number of products in the portfolio and the product cash margin generated from that portfolio. The cash margin per product (FAC Metric) was calculated by dividing the cash margin generated by the number of products in the portfolio.

The changes in FAC sophistication levels and the changes in NPD portfolio performance findings, by case, for the intervention and control cases, are presented in Table 15 in the results section.

The next section describes the semi-structured interviews, post intervention actions, post cycle, with intervention participants.

3.4.1.6 Post Intervention, Post Cycle, Semi-Structured Interviews

This section describes the method for the post-intervention data capture, when the cycle of intervention actions had been completed. As can be seen in the overarching research approach (Figure 36), this data is used for managements' perception of changes in FAC levels and changes in portfolio performance. It is also used for developing the process model (Van de Ven, 2007) and providing evidence for the three practical benefits tests (Platts, 1993).

Semi-structured interviews, with the intervention participants, post intervention, are used to capture this data. The methodology also provides data and methodological triangulation. The Portfolio Performance Framework (Figure 35) is used to guide data collection of managements' perception of changes in soft measures of performance. The focal unit management assessment of changes in the FAC level are also captured in these interviews and reported with the hard metrics.

The research design rationale being discussed in this section is that of FAC levels and performance. The protocol used is presented in Appendix V and is designed to capture the points above. A direct question on managements' perception of any relationship between control and performance is included in the protocol.

A schedule showing detail of the informants participating in the semi-structured interviews is presented in Appendix W. 13 interviews were carried out. 12 of the interviews were with informants who had participated in the intervention. The total number of intervention participants was 30. Therefore 40% of intervention participants were interviewed post completion of all intervention actions and after capture of the portfolio value changes for the following comparative key season. Industry specific role descriptions are described in Appendix M.

The interviewees represented all six cases and different functions participating in the stage-gate review meetings. The total interview time, with the 13 informants was 8 hours and 36 minutes.

The next section discusses the additional interviews with the Group COO and Group CFO.

3.4.1.7 Additional Triangulation Interviews – Group COO and Group CFO

The six intervention cases are all NPD teams within the same group. The group strategy, subsidiary strategies, subsidiary performance and business portfolio is managed by a small executive, the Group Executive, comprising of four directors. Two of the directors who sit on this Group Executive, the Group COO and Group CFO, review the performance of all the subsidiaries as a key responsibility of their roles. An opportunity to interview these two directors therefore provides a triangulation opportunity and cross-business assessment. The two directors were in role throughout the period of the study.

The protocol used is presented in Appendix X. The total interview time for the two informants was 46 minutes.

Given the valuable cross-business perspective of these two informants the coding of this data is based on the core objectives of this project. The coding is presented firstly by the informants observed changes in NPD controls, secondly their observed changes in portfolio value and strategic alignment, thirdly their perceptions on the relationship between the changes in control and changes in performance and finally on the feasibility, usability and utility of the FAC Framework.

3.4.1.8 Documents

Product portfolio planning documents, including product category strategy and plans, were accessible from all the cases. These documents include the performance measures and analytics, in schedules and charts, used by the NPD management team.

Some of these performance management schedules have been presented in the results. These documents have been used to support development of the coding and findings (Figures 44, 52, 57, 58, 59, 62).

3.4.1.9 Action Research Standards – FAC Levels and Performance

The consideration of the explicit relation of method to theory, developing theory from a synthesis of the emergent data and a clear “consumer take-away” are important checks in the Eden and Huxham (1996) action research standards (Appendix R), Contentions 3, 4 and 6:

"Contention"	**The performance of this study compared to the contention "checklist"**
Contention 3 *If the generality drawn out of action research is to be expressed through the design of tools, techniques, models and method, then this alone, is not enough – the basis for their design must be explicit and shown to be related to theory.*	The generality has been expressed by the development of the two frameworks and also the explicit relationship of the FAC Framework to management control systems theory.
Contention 4 *Action research will generate emergent theory, in which the theory develops from a synthesis of that which emerges from the data and that which emerges from the use in practice of the body of theory which informed the intervention and research intent.*	The intervention, raising FAC Levels, is to improve performance and develop theoretical knowledge. The interventions provide the opportunity to test a new and complex theoretical framework.
Contention 6 *What is important for action research is not a (false) dichotomy between prescription and description, but a recognition that description will be prescription (even if implicitly so). Thus the presenters of action research should be clear about what they expect the consumer to take from it and present with a form and style appropriate to this aim.*	The consumer "take-away" is that raising levels of FAC influences NPD management teams to improve portfolio performance and strategic alignment. Also, for practice, the intervention methodology can be used as a "toolkit" to change the levels of FAC applied.

This section has discussed the design rationale behind FAC levels and performance, describing the unit of analysis, the selected cases, the intervention method and data capture.

There are three key components of the design rationale that are considered in this section on the detailed research design. Firstly, FAC levels and performance, described above. Next the Process Model (Van de Ven, 2007) is discussed.

3.4.2 EXPLAINING THE "HOW" OF THE CHANGE: PROCESS MODEL

This section describes the method used for the empirical inductive development of a visual developmental process model (Van de Ven, 2007) that can provide a richer understanding of how the intervention causes change over time in the focal unit. This approach can help reveal the underlying generative mechanisms of the changes in controls adopted by the NPD teams, post intervention. The description of the sequence of events explains why the intervention causes changes that management find useful for managing large portfolios of product through stage-gate NPD. Therefore the presentation of this model provides evidence to validate the findings of the project and also a much richer understanding of the changes in controls. The approach also provides methodological triangulation for the study.

When developing or testing theories of how organizations change or evolve over time process studies are 'fundamental' for obtaining comprehension (Van de Ven, 2007 p145). A 'story that narrates the sequence of events' can help explain how those events lead to a particular outcome. Van de Ven defines organizational change as 'a difference in form, quality, or state over time in an organizational entity' (Van de Ven, 2007 p 195).

Van de Ven (2007 p220) also suggests using 'visual mapping' to organize and present data. Visual mapping is useful for presenting 'precedence, parallel processes and the passage of time'. The data can be coded as 'events' which are 'abstract concepts of bracketed or coded sets of incidents', where incidents are 'operational empirical observations' (Van de Ven, 2007 p217). The observations from this project of how, over time, the changes in the way the NPD team manage product selection is presented using the Van de Ven (2007 p199), proposed approach of a 'developmental process model'.

Using this technique, presenting how change happens over time, post intervention, provides evidence to assess the two propositions being tested in this study, and also the practical benefit tests of feasibility, usability and utility (Platts, 1993). The data, visual map and process model event sequence provides a richer understanding of why the intervention causes changes that management find useful for managing large NPD portfolios.

The process map is developed using data from both the interventions and the semi-structured interviews. In the results the source of the data is identified for each "event", whether "intervention" or post-intervention "interview". For the intervention the case descriptor is shown and for the interviews the case descriptor and interviewee role are noted. Each stage of the process model construction is shown when developing the visual map to aid understanding of each step taken with "mapping" the event coded data. The horizontal axis of the model is "time", post the intervention, and the vertical axis is the proximity of the event to management's final observed overall perception of the improvement in NPD portfolio performance.

The model, involving visual mapping of the data, is developed step-by-step from the coded data. In the results, there are 16 steps presented in developing the process model.

Of the three key components of the design rationale that are considered in this section on the detailed research design FAC levels and performance and the Process Model have been discussed. The final detailed design rationale component discussed next is the practical benefits tests.

3.4.3 PRACTICAL BENEFITS TESTS

The contribution to knowledge of practice can be supported by evidence of the practical utility of the FAC Framework in the management of large NPD portfolios. Assessing this practical utility can be done by capturing evidence of the FAC Framework for feasibility, usability and utility (Platts, 1993).

There are multiple methods used to capture data to assess performance against these three practical benefits tests. Firstly, in the post cycle semi-structured interviews, informants are asked directly if the FAC Framework can be used, is easy to use and is useful. Secondly, changes captured in FAC levels and observed changes in performance, both in hard and soft metrics can provide supporting evidence. Thirdly, if management observe that achieving higher levels of FAC sophistication is contingent on consolidation of lower levels of FAC, would also indicate that the Framework has practical utility. The process model (Van de Ven, 2007), showing how change happens post-intervention, can also provide evidence of feasibility, usability and utility.

The three key components of the detailed research design, exploring changing FAC levels and capturing changes in performance, the construction of a process model (Van de Ven, 2007) and assessing the FAC Framework against the three practical benefits tests (Platts, 1993) are used to present the findings that provide evidence for assessing the two propositions.

Next, the methods for capturing data to assess changes in strategic alignment are discussed.

3.4.4 STRATEGIC ALIGNMENT

To assess the second proposition of this study requires testing of whether higher levels of FAC influences NPD management teams to improve strategic alignment.

The multiple methodological lenses provide data to test this proposition (Table 11). Firstly, the soft measures of performance on the Portfolio Performance Framework (Figure 35) includes the perception measure of “cross-functional alignment’. This measure is categorized by the cross-functional NPD management team being ‘joined-up at the big picture’ and achieving a balance of goals across the different functional requirements. The soft measure of “cross-functional alignment” is a proxy for strategic alignment.

Secondly the process model can show, post-intervention, any changes in cross-functional working and controls that change the NPD teams’ perceptions of strategic alignment.

Thirdly the Group COO and CFO data can provide triangulation of these first and second sources of evidence.

Next, the approach to coding is described.

3.4.5 CODING

This section describes the questions asked in analysing the data and the coding process that was applied to the data.

The data captured during intervention and the data captured in the semi-structured interviews post intervention provide key data for the findings of this project. The analysis and coding of the data is carried out using five “lenses”. The first lens looks

for evidence of changes in the “soft” performance measures (Figure 35). The second lens captures ‘events’ (Van de Ven, 2007 p217) the focal unit undergoes as the NPD team changes the approach to portfolio performance management, over time. The third lens looks for evidence on the NPD teams’ perception of the relationship between changing the level of FAC, that is a change in controls in the NPD process, and a change in performance. The next lens captures managements’ view of whether achievement of the higher FAC levels is contingent on consolidation of the lower levels, a finding from my first empirical study to be tested in this final action research study. The final lens directly focuses on the practical benefits tests of feasibility, usability and utility of the FAC Framework.

The questions asked when analysing the data were:

1) What example is this of a change in soft measures performance as perceived by management?
2) Is this a significant improvement in perceived soft measures performance?
3) Is this a soft measure where management perceive there has been little or no improvement?
4) Is this a significant observed performance improvement that management perceive not to be related to changes in FAC levels?
5) What example is this of an ‘event’ that the focal unit is undergoing as management changes the approach to product range building?
6) What is managements’ perception of changing the levels of FAC and observed changes in performance?
7) What are managements’ views on the achievement of higher levels of FAC being contingent on consolidation of the lower levels of FAC?
8) Do management consider the FAC Framework has feasibility, usability and utility?

In the results section of this study, the resultant codes have been developed out of the data. This evidence is presented in a clear and traceable chain (Gibbert et al., 2008; Yin, 2009 p122).

When asking the respective questions, noted above, of the data, a ‘line-by-line, whole sentence and paragraph’ analysis open coding of the data was undertaken (Strauss and Corbin, 1998). The open coding approach analysed each transcription

‘sequentially, extensively and in detail’, with no pre-existing reading applied. “Meaning units” were found and aggregated into ‘concepts that bind together the individual partial units’, resulting in the ‘interpretation controlling the data collection’ (Reichertz, 2004).

The initial step of the coding process was to label the respective data points in the margins of the transcripts. These labels were next summarised for each intervention observed and each semi-structured interview. For each case intervention the coding is traced back to the respective case, when presenting the results. Similarly, for the semi-structured interviews this is tracked to the individual informant/role, in each of the respective cases.

The next step was to collate the coded data as a categorized response to each of the questions being asked of the data. This is the method used to code the data for the management perceived changes in soft performance measures, the other management observed drivers of significant portfolio performance improvement, the constructs representing events in the developmental process map, management perception of the relationship between control and performance, management perception on consolidation of FAC levels for achieving higher levels of FAC and finally for assessing the FAC Framework against the tests of feasibility, usability and utility.

Next, implications for this study identified in the first empirical study are discussed.

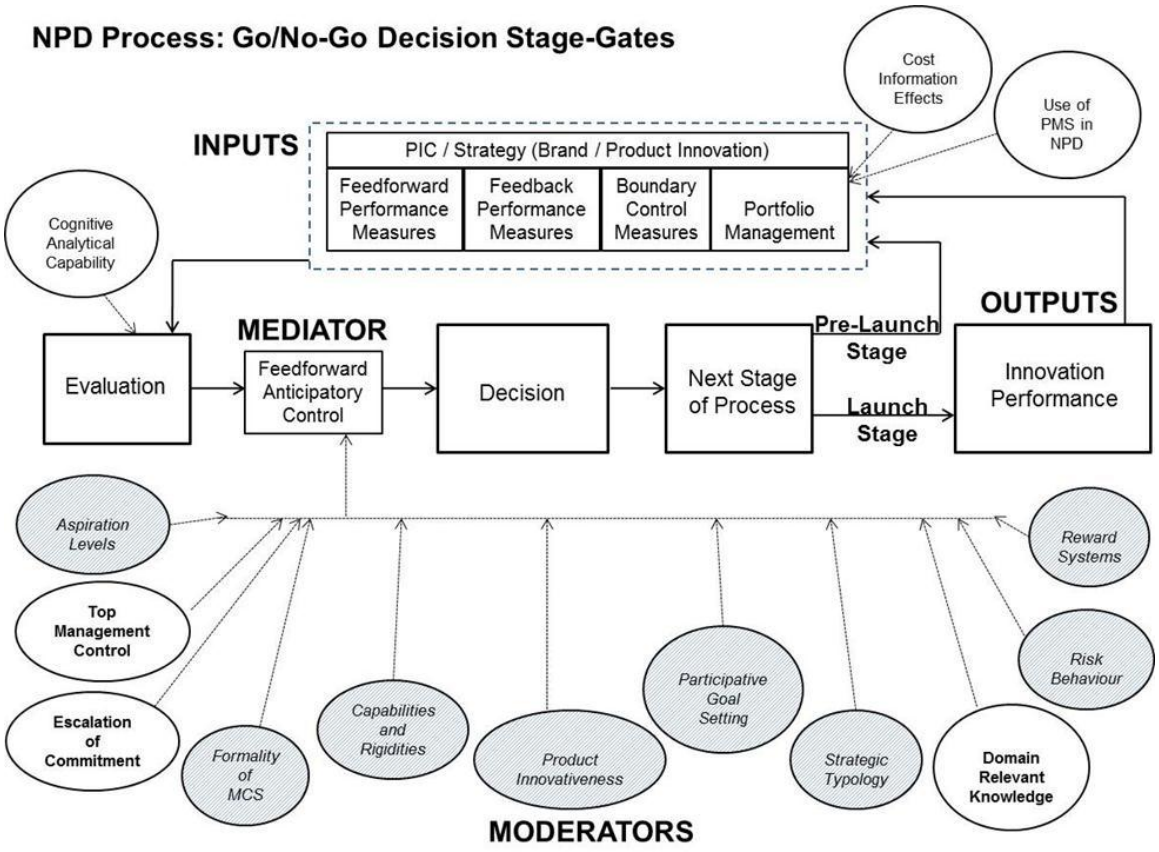
3.5 Implications Identified in the First Empirical Study

There were findings and implications for this action research study that are identified in my first empirical study (Project 2). This section revisits and considers those implications and the actions taken in this project to address them. These related findings were firstly the commercial relevance of changing the levels of FAC in stage-gate NPD and secondly the achievement of higher FAC levels being contingent on consolidation of the lower FAC levels. Thirdly, the implication of the research design, noted in the first empirical study, that some of the systematic literature view identified moderators have not been controlled for in the research design. These moderators are also discussed in this section.

In the first empirical study the sense checking of the resultant frameworks with knowledgeable informants suggested that there is commercial relevance to NPD team adoption of the FAC framework as a guide to improving control and delivering NPD performance improvements. This crucial observation on the relevance of the study is being tested in this project by capturing “hard” portfolio performance and soft measures performance changes post intervention.

The methodology of this action research study is designed to capture data to support the first empirical study finding that achievement of higher FAC levels is contingent on consolidation of the lower FAC levels.

Figure 39 Graphical Synthesis of the Systematic Literature Review Results



The shaded moderators (Figure 39) are those that can be controlled for in the research design.

Another implication from the previous empirical study is on the moderators that have not been controlled for in the research design (Figure 39).

Most of the moderators identified in the systematic literature review can be controlled for by the research design and the organization context. The individual business strategies, targets and performance are all reviewed and challenged by the same Group executives with each relevant set of subsidiary executives. There is also a regular movement of individuals between the businesses, a shared set of training programmes and a single Group management development scheme. Therefore the moderators of aspiration levels, formality of management controls, risk behaviour, and capabilities and rigidities can be controlled for in the research design. There is a single approach to strategic business planning used by all the subsidiaries in the Group and the remuneration and bonus scheme is the same across the Group, approved and signed-off annually for all employees by the Group CEO. Therefore participative goal setting and reward systems can be controlled for in the design. Finally, the businesses are all operating in the branded footwear and apparel industry, therefore controlling for product innovativeness and strategic typology.

Controlling for the moderators in the research design is important. The assessment of the propositions and whether management find that the FAC Framework has practical utility will be better supported if the literature identified FAC moderators are controlled for in the design. For example, when interpreting results the researcher knows that the reward systems are not a factor needing to be considered across the different cases, to understand the NPD management changes made to the stage-gate process.

The three “moderators” not controlled for in the design, that can affect the application of FAC, are (the subsidiary) top management control, escalation of commitment and domain relevant knowledge. These moderators will be analysed by cross-case comparison, between the cases, for validity purposes.

The three moderators that are not controlled for are briefly discussed in the next sub-sections and the attempts to consider their effect on the study.

3.5.1 CONTROLLING FOR THE TOP MANAGEMENT CONTROL MODERATOR

The opportunity to control for the “Top Management Control” moderator was made available before the intervention work started. This took the format of a presentation, jointly to the heads of all the subsidiaries in the selected cases. I presented:

1) stage-gate review meetings shown as a controls system (Figure 37)
2) The systematic literature review summary on balancing control and creativity, in a graphical format (Figure 37)
3) The systematic literature review summary on “Top Management Intervention – Beneficial and detrimental behaviours” (Appendix S)

This presentation raised awareness of the moderating aspects of top management control to all the heads of the businesses being studied in this project. It used the same communication approach and content, presented at the same time, to all the subsidiary Managing Directors.

These “Top Managers” meet regularly as a group to discuss business issues of common concern, including portfolio performance management. They have each been a senior manager within the Group for a number of years and all report into the same Group Executive. Therefore the Top Management Control moderator may not be controlled for but the difference in the NPD behaviours between these business heads is less likely to be significant in the moderating effect on FAC.

Top managers (MDs and Directors) participated in all six intervention cases. A cross-case comparison is discussed in the results.

3.5.2 DOMAIN RELEVANT KNOWLEDGE

The systematic literature review found that a recent study has argued that knowledge is a key factor in creativity and innovation, with greater knowledge having a beneficial effect on creativity (Wynder, 2007). The study suggests that controls should be lower when NPD managers have high domain relevant knowledge since this will enhance the creative output. Therefore domain relevant knowledge was identified in the systematic literature review as a moderator of FAC.

However, it was not possible in the research design to control for domain relevant knowledge. The industry experience by intervention participant was captured as an indicative measure of domain relevant knowledge (Appendix T). This measure can be used to indicate any significant differences between the cases on domain relevant knowledge (Table 14).

The Sport-Two participants had the lowest average experience at 5.5 years, though the two senior roles had at least seven years' experience. Sport-Two, post intervention, had the second highest reported FAC level, Level 6, out of the six cases (Table 14). Sport-One participants, the second lowest average experience participants, at 8.2 years, achieved the highest reported FAC level, Level 7. Sport-One also achieved the biggest change in reported product cash margin per product improvement and the second highest increase in range cash margin improvement. Foot-One with the highest average experience, at 20 years also achieved significant improvements in FAC level, range cash margin and cash margin per product (Table 14).

Table 14 Intervention Participants – Industry Experience

Case	**Industry Experience (years)**
Sport-One	Range 1.8 to 25.0 Mean 8.2 Median 5.4
Sport-Two	Range 1.8 to 7.8 Mean 5.5 Median 7.0
Walk-One	Range 1.2 to 22.0 Mean 12.4 Median 10.6
Foot-One	Range 13.0 to 27.0 Mean 20.0 Median 20.0
Fashion-Two	Range 1.2 to 38.0 Mean 14.8 Median 10.7
Fashion-Three	Range 2.0 to 25.0 Mean 12.7 Median 12.0

These results would indicate that in this study there is no observed direct relationship between domain relevant knowledge, the final achieved FAC level, FAC metric performance and portfolio value change.

A review of the experience data suggests that all the case teams had many years of domain relevant experience, ranging on average from 5.5 years to 20 years. It has not been possible to control for any moderating effect of domain relevant knowledge on FAC and performance changes between cases. However, the hard measures results (Table 15) and the case management experience would indicate that it is not having a cross-case effect in this study. Further research would be required to better understand any moderating effect on FAC.

3.5.3 ESCALATION OF COMMITMENT

In my systematic literature review I noted the phenomenon of 'escalation of commitment', defined as the excessive investment in a course of action, where decisions are made that go beyond that which the circumstances warrant. It is argued that the propensity for such behaviour is very high during NPD (Schmidt and Calantone, 1998, 2002) with the most closely related behavioural mechanism being self-justification (Schmidt and Calantone, 2002) and also where managers are inclined to bias the evaluated information according to their preferences and beliefs. Therefore I concluded that this behaviour can act as a moderator in the application of FAC.

This particular moderator is under scrutiny in the project because it is directly related to the soft measure of "Objective informed decision-making" in the Portfolio Performance Framework (Figure 35) identified by the performance sub-categorization of "Emotion and escalation of commitment is managed".

The two moderators of Top Management Control and Escalation of Commitment, not controlled for in the study, will be discussed in the cross-case comparison in the results.

The third moderator, not controlled for, Domain Relevant Knowledge, has had cross-case comparison discussed in this section. Further research would be required to better understand any moderating effect but the average industry experience data from across the case NPD management teams and the results would suggest that

any effect on assessing the propositions and the practical utility of the FAC Framework is small.

Having revisited and considered my previous empirical study identified implications for this action research study, the final part of this section discusses the case for establishing rigour in the project.

3.6 Establishing Rigour: Reliability and Validity

I assess and demonstrate validity by the methodology addressing construct validity, internal validity and also the use of data and methodological triangulation.

I consider construct validity first.

3.6.1 CONSTRUCT VALIDITY

As discussed in my first empirical project (Project 2), construct validity refers to the 'quality of the conceptualization' or the operationalization of the concept and the extent to which 'a procedure leads to an accurate observation of reality' (Gibbert et al., 2008).

In this study construct validity has been supported by the presentation of the protocols and the transparent and traceable coding from the data. This demonstrates, with traceability and replicability, how I made my decisions and judgements. This exhibits a 'clear chain of evidence' and the journey from research question to conclusions (Gibbert et al., 2008).

The use of data and methodological triangulation in this study also supports construct validity and is discussed next.

3.6.2 TRIANGULATION

Triangulation was also discussed in my first empirical study, where I note that study findings or conclusions are 'likely to be more convincing and accurate' and allow 'convergence of evidence' if they are based on triangulation using several different sources of data and information (Yin, 2009 pp114-116). The findings from each data source and method are analysed together to enable 'corroboration' using 'multiple measures of the same phenomenon' (Yin, 2009; Miles and Huberman,1994).

Triangulation also helps achieve coding and theoretical saturation, where no new categories are found (Partington, 2002 p151). The use of triangulation supports construct validity, which in turn improves reliability (Gibbert et al., 2008; Yin, 2009; Miles and Huberman, 1994).

This study has used multiple examples of the unit of analysis within the same organization. There is data triangulation from the six cases of NPD teams. There is methodological triangulation using hard measures of performance, soft measures of performance, observation of change over time, semi-structured interviews and documents. Additional triangulation is provided by the final interviews with the Group CFO and Group COO, who, in their roles, observe the control and performance changes across all six cases, over the whole of the study period.

It is this use of triangulation that supports construct validity.

In the earlier section discussing action research as a methodology, triangulation is noted as an additional and ‘exceptional’ advantage of the methodology (Eden and Huxham, 1996). There are triangulation opportunities between observations of interventions and their impact, and also with participant accounts. These triangulation advantages have been taken up in the research design for this project.

I next discuss the sources of reliability and validity in this action research study.

3.6.3 INTERNAL VALIDITY AND RELIABILITY

The sources of reliability and validity in this study are from the rigour, the applied research approach, the research design and the methodology and triangulation. I have also carefully considered the level of analysis to assist generalizability.

I note in my first empirical study that validity can be established by a focus on theory elaboration and development, quality of systematic method, replicable exploration processes, critical interpretation of context and history, the use of data and methodological triangulation and clear research frameworks (Eden and Huxham, 2002; Denzin 1978a, 1978b; Gibbert et al., 2008). The frameworks used in this study, developed in the first two projects of the overall study, with a focus on theory elaboration, and the findings from the action research in this final project have been developed using rigorous applied research, with transparency of design and

methodology that can enable replicability. This study also uses data and methodological triangulation. Therefore this supports validity when assessing the propositions and the practical benefits tests.

The potential generalisation is at the focal unit level (Rousseau, 1985). The focal unit, the unit of analysis, is a separate self-contained NPD portfolio management team. The project carries out the study at this level of analysis and is aligned with the study level of measurement, both in hard and soft metrics. Therefore this supports generalizability of the results for NPD teams managing large product portfolios.

The methodological approach used in this study provides greater reliability of the results. Reliability denotes the ‘absence of random error’ (Gibbert et al., 2008). In this study I achieve greater reliability through the presentation of the field study protocols, the clarification of the research procedures, data and methodological triangulation and the transparency, traceability and replicability of coding development.

Reliability has been strengthened by the use of multiple cases, with most of the literature review identified moderators being controlled for in the design. Intervention participants and interview informants represent all the functions involved in NPD, including at Senior and Junior management levels. The participants and informants also represent all the functions participating in the stage-gate review meetings.

The use of other triangulation opportunities also strengthens reliability. This includes multiple participants and informants for each case, the use of both hard and soft metrics, the inductive development and presentation of the developmental process map (Van de Ven, 2007) and data captured from the Group CFO and Group COO. These different methodological approaches support rigour and reliability in the project.

Reliability also comes from looking at the issue with different lenses, the components of the research design used; Eden and Huxham standards of action research (1996), the Van de Ven engaged scholarship research framework (2007) and Platts practical benefits tests (1993). The Eden and Huxham standards provide a checklist for the quality of the action research undertaken in this project and therefore supports reliability. The Van de Ven framework provides a robust overarching research

framework for the overall study and therefore also underpins reliability. The Platts tests provide a sound approach for assessing the practical utility of the FAC Framework.

Therefore the methodological approach, multiple lenses, rigour and triangulation have enhanced reliability.

The consideration of replicable exploration processes and triangulation opportunities are important checks in the Eden and Huxham (1996) action research standards (Appendix R), Contentions 8 and 11:

"Contention"	**The performance of this study compared to the contention "checklist"**
Contention 8 *For action research, the process of exploration (rather than collection) of the data, in the detecting of emergent theories, must be either, replicable, or demonstrable through argument or analysis.*	The research design, methodology, results and analysis are explained and presented. This will allow and enable replicability of the "process of exploration".
Contention 11 *In action research, the opportunities for triangulation that do not offer themselves with other methods should be exploited fully and reported, but used as a dialectical device which powerfully facilitates the incremental development of theory.*	Triangulation has been a key focus in the research design. For Project 3 there are multiple cases and informants, in different NPD roles, in each case. There is observation of review meetings, semi-structured interviews, capture of performance measures and study of documents. This provides both data and methodological triangulation, 'multiple instances from different sources, using different methods' (Miles and Huberman, 1994). The research design also enables cross-case comparison.

4 RESULTS

The results are presented in seven sections. Firstly the hard metric results are presented, for each case, showing the changes in FAC sophistication levels and the measures of portfolio value and portfolio productivity. Secondly the soft performance

measure results are presented in two sub-sections; i) measures with significant improvement and ii) measures with little or no improvement. This includes capture of soft measures data on changes in strategic alignment. Results of other observed management perceived drivers of significant portfolio performance improvement not related to changes in FAC levels are reported.

Thirdly the developmental process model is developed inductively and includes a reliability sense check of the model with informants. Fourthly the management perceptions on the relationship between FAC and portfolio value are presented, followed, fifthly, by the management views on achievement of higher FAC levels being contingent on consolidation of lower FAC levels. The sixth section presents the data captured when asking informants directly whether they consider that the FAC Framework has feasibility, usability and utility. The final section presents the data from the additional semi-structured interviews with the Group CFO and the Group COO. This includes data on changes in strategic alignment.

First I present the hard metrics results of portfolio value and portfolio productivity.

4.1 Portfolio Value and Portfolio Productivity - “Hard” Metrics

The portfolio value results are presented in this results section, for each case. Table 15 presents the pre-intervention and post-intervention FAC levels (Figure 34), “self-assessed” by focal unit management in the intervention cases. Next the pre-intervention and post-intervention portfolio sizes are presented, in terms of numbers of products. The portfolio value change and the portfolio productivity change are shown for each case.

For the intervention cases, the self-assessed FAC level changes ranged from upwards movements of between two to five levels of FAC sophistication. Three cases moved upwards by two levels; Sport-Two “Casual”, Walk-One “Apparel” and Fashion-Three. Two cases moved upwards three levels; Foot-One and Fashion-Two “Apparel”. Sport-One moved the highest number of levels, five levels upward. Sport-One was the first intervention and lasted the longest, 42 weeks, 11 weeks more than the next nearest case, Walk-One “Apparel” at 31 weeks (Table 13). This may have been a factor in Sport-One achieving a higher change in FAC levels.

TABLE 15 Portfolio Performance – "hard measures"

	INTERVENTION CASES	Sport-One	Sport-Two "Casual"	Walk-One "Apparel"	Foot-One	Fashion-Two "Apparel"	Fashion-Three	TOTALS
Sales $millions		515	105	98	20	3	20	**761**
FAC LEVEL	Pre-Intervention	2	4	2	1	1	1	
	Post-Intervention	7	6	4	4	4	3	
	Change in FAC Level	**+ 5**	**+ 2**	**+ 2**	**+ 3**	**+ 3**	**+ 2**	
Portfolio Size (No. of Products)	Pre-Intervention	846	267	916	275	393	187	**2,884**
(Key Season Ranges)	Post-Intervention	658	238	800	207	138	169	**2,210**
	Change incr/(decr) %	**(22.2)%**	**(10.9)%**	**(12.7)%**	**(24.7)%**	**(64.9)%**	**(9.6)%**	**(23.4)%**
Portfolio Value	**Change incr/(decr) %**	**16.1%**	**11.9%**	**12.1%**	**15.5%**	**31.6%**	**11.2%**	**14.6%**
Portfolio Productivity	**Change incr/(decr) %**	**49.3%**	**25.5%**	**28.4%**	**53.4%**	**274.7%**	**23.0%**	**49.5%**

	CONTROL CASES: NO INTERVENTION	Sport-Two "Sport"	Walk-One "Equipment"	Fashion-Two "Footwear"	TOTALS
Sales $millions		335	17	41	**393**
FAC LEVEL	Pre-Intervention	2	2	1	
	Post-Intervention	2	2	1	
	Change in FAC Level	**0**	**0**	**0**	
Portfolio Size (No. of Products)	Pre-Intervention	380	231	345	**956**
(Key Season Ranges)	Post-Intervention	430	231	408	**1,069**
	Change incr/(decr) %	**13.2%**	**0.0%**	**18.3%**	**11.8%**
Portfolio Value	**Change incr/(decr) %**	**14.3%**	**(4.2)%**	**(23.1)%**	**7.8%**
Portfolio Productivity	**Change incr/(decr) %**	**1.0%**	**(4.2)%**	**(35.0)%**	**(3.6)%**

For all the intervention cases, the focal unit management report positive upward movements in their self-assessed FAC levels, over the period of the project.

There were no observed changes in the FAC levels of the three control cases (Table 15).

Aggregating the results across all six intervention cases shows that the total product key range size reduced from 2,884 products down to 2,210. This represents an aggregate reduction in key range sizes of 23.4%. The aggregate key range cash margin increased by 14.6% and the portfolio productivity (FAC Metric) increased by 49.5%.

The control cases, with no intervention, had discernible different results. The aggregate portfolio size increased from 956 products up to 1,069, an increase of 11.8%. The portfolio value increased by 7.8% and the portfolio productivity decreased by 3.6%.

The largest percentage changes in the intervention cases, in portfolio size, portfolio value and portfolio productivity was Fashion-Two “Apparel”. This case represented the smallest revenue business, compared to the other five intervention cases, with annual sales of $3m, and the second highest movement in FAC levels, an increase of three levels, to FAC sophistication Level 4. Sport-One, the highest sales revenue intervention case, with annual sales of $515m, had a 22.2% reduction in portfolio size, a 16.1% increase in portfolio value and a 49.3% increase in portfolio productivity.

By comparison, in the control cases, the case with the most improvement in hard metrics over the period, was Sport-Two “Sport”. The business has annual sales of $335m, the second largest of all the eight cases. In Sport-Two “Sport” the portfolio value increased by 14.3%, similar to the aggregate level achieved across the intervention cases. The portfolio size increased by 13.2% and therefore portfolio productivity, the FAC metric, improved by 1.0%. This improvement in the FAC metric is significantly lower than the average 49.5% achieved in the intervention cases.

The poorest performing case was the control case Fashion-Two “Footwear”, with annual sales of $41m. The portfolio size increased by 18.3%, the portfolio value decreased by 23.1% and the portfolio productivity decreased by 35.0%. This case

business had enjoyed a period of revenue growth up to the comparative key season and the sales performance contracted in that following comparative season.

The improvements in levels of FAC sophistication and the portfolio value results in the intervention cases, by comparison to the control cases, provides evidence to support the first proposition and that focal unit management find the FAC Framework has feasibility, usability and utility. This evidence can also support any management perception of a relationship between changing FAC levels and changes in portfolio performance.

The next section presents the results of the changes in soft perception measures in the intervention cases. These findings provide supporting evidence for assessing the first proposition and the feasibility, usability and utility of the FAC Framework.

4.2 “Soft” Perception Measures – Portfolio Value and Performance

The Portfolio Performance Framework (Figure 35) has six “soft” perception measures of performance; range structure performance, design performance, price architecture performance, objective informed decision-making, up-front planning performance and cross-functional alignment. This framework was developed to observe the changes in portfolio performance, post intervention, with both hard and soft measures.

The observed changes in “soft” management perception measures of portfolio performance, post intervention, provides further evidence for validating the first proposition and for the feasibility, usability and utility of the FAC Framework.

The methodology has captured three categorizations of soft measures change in portfolio performance. Firstly, where management perceive that there have been significant improvements in performance. Secondly, where management perceive that there has been low, or no improvement. Thirdly, where management perceive significant improvements in portfolio performance, not related to changes in FAC levels.

The next section presents the results from the first categorization, where management perceive that there have been significant improvements in performance.

4.2.1 SOFT MEASURES WITH SIGNIFICANT IMPROVEMENT

A summary schedule of the results, where management perceive a significant improvement in portfolio performance is presented in Table 16.

The summary schedule shows that most of the informants (12 out of 13) observe significant improvements in “range structure performance” and a smaller number (8 out of 13) observe significant improvements in “objective informed decision-making”. Just under half the informants (6 out of 13) observe significant improvements in “cross-functional alignment”.

Fewer informants (4 out of 13) observe significant improvements in “design performance”, and finally, 3 out of 13, for “price architecture performance” and 2 out of 13 for “up-front planning performance”.

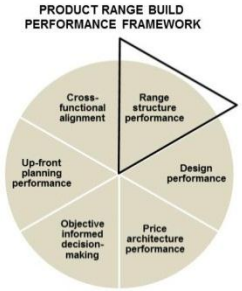
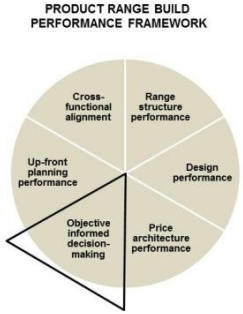
The first three soft measures of portfolio performance, where a large number of informants report significant improvements in performance are presented with supporting data below; range structure performance, objective informed decision-making and cross-functional alignment.

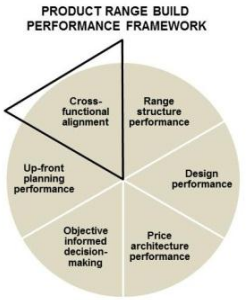
Supporting data on the other three soft measures, where fewer informants observed significant improvements in performance are presented in Appendix Y: design performance, price architecture and up-front planning.

A notable finding in these results is that informants from Sport-One observed significant improvements in all the measures, except “price architecture performance”. Sport-One had the biggest change in FAC Levels from FAC Level 2 up to FAC Level 7. FAC Level 7 was also the highest level achieved by any of the intervention cases.

With range structure performance, where most of the informants observe significant improvement in performance, informants note how crucial the change in range structure performance has been to ‘delivering overall improvement in performance’. Management note the improvement in product productivity (the FAC metric), the reduction in “duplication” and “cannibalisation”, taking out the ‘bad’ products and having more justification on the role of each product in the range.

TABLE 16 "SOFT" PERCEPTION MEASURES – SIGNIFICANT IMPROVEMENT

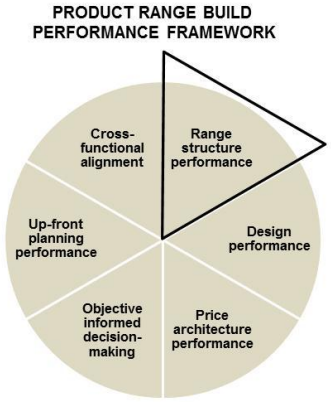
"SOFT" PERCEPTION MEASURE	CASE	ROLE	INTERVIEWEES NOTING SIGNIFICANT IMPROVEMENT (# / total interviewees)
Range structure performance 	Sport-One Sport-Two Walk-One Foot-One Fashion-Two Fashion-Three	Supply Chain Manager; COO; Business Analyst Product Category Director; Business Analyst Category Manager; Supply Chain Manager Managing Director; Category Manager; Head of Supply Chain Product Manager Supply Chain Manager	12 / 13
Objective informed decision-making 	Sport-One Sport-Two Walk-One Foot-One Fashion-Two Fashion-Three	COO; Business Analyst Product Category Director Supply Chain Manager Head of Supply Chain Product Manager Managing Director; Supply Chain Manager	8 / 13

“SOFT” PERCEPTION MEASURE	**CASE**	**ROLE**	**INTERVIEWEES NOTING SIGNIFICANT IMPROVEMENT (# / total interviewees)**
Cross-functional alignment  	Sport-One Sport-Two Walk-One Foot-One Fashion-Three	Supply Chain Manager Product Category Director; Business Analyst Supply Chain Manager Head of Supply Chain Managing Director	6 / 13
Design performance	Sport-One Sport-Two Walk-One	Business Analyst Product Category Director Category Manager; Supply Chain Manager	4 / 13
Price architecture performance	Walk-One Foot-One	Category Manager Category Manager; Head of Supply Chain	3 / 13
Up-front planning performance	Sport-One	COO; Business Analyst	2 / 13

On objective informed decision-making management describe the improved management of “emotion” in the process where there is less reliance on only ‘judgement’ and ‘feeling’ and more decision support with ‘information and facts’. This result was observed by informants from all six intervention cases, which is evidence for the cross-case comparison findings on “escalation of commitment”, one of the moderators not controlled for in the research design.

With the third measure of cross-functional alignment, management note more cross-functional involvement, ‘everyone working from the same sheet’, ‘working as one team rather than functions’, ‘more aligned to purpose’, the introduction of cross-functional forecasting, with a more ‘performance driven culture’ and where people have a better understanding of their roles and responsibilities. These findings are evidence for improvement in strategic alignment.

RANGE STRUCTURE PERFORMANCE



Related overall improvement in portfolio performance:

Sport-One: COO

The change in range structure performance has been crucial to delivering the overall improvement in performance.

Reduction in product duplication:

Sport-One: Supply Chain Manager

We’ve definitely improved in the range structure performance. We’re now looking at the range as a whole, rather than in silos. When we looked at it as a whole there was a lot of duplication. This product is delivering “this” and the other product is delivering “that”. If we put them together, “what’s that going to do?”.

Related improvements to portfolio productivity:

Sport-One: Business Analyst

Our SCO tail and SCO count has come down considerably. There's definitely been an improvement in SCO productivity. We are starting to cut out a lot of the stuff, "the big chunk of the big tail". It was dragging the whole average down. You'll always have that. Looking at the Performance Framework, you can't just have a core range, you've got to have newness brought into it.

The way I would sum up the change is that before we used to think that SCOs were bad, as in too many SCOs was bad, whereas now it's not that SCOs are bad it's that you have bad SCOs. If you've got a lot of SCOs making you money that's good, the differentiation is getting rid of the bad SCOs. You could take a big axe to the tail and that would be "I'm getting rid of SCOs", whereas the way we've gone about it is we're going to take out the bad SCOs. Which is a slightly more difficult thing to do.

Definitely in range structure performance, with the role of each SCO being justified.

Related improvements to portfolio productivity:

Sport-Two: Product Category Director

Yes, we went from being a very wide range of products, so we were trying to do everything for everyone, to doing things successfully where we've had much more focus on the productivity of each of the parts of our product range. We're less concerned about "Oh, it's a great shoe and should be in the product line" and much more concerned about is it the right price point, are we making money off it, where are we wasting money, is it in the right distribution. I think having less models [styles] and more SKUs has helped us to go deeper in terms of each shoe. It's helped the designers because they can focus. It's helped the developers because they don't have as much work to do, so they can work on getting the price of that shoe right.

I think what's been important for me as well is if you looked at what used to deliver our business, we were never even 80% coming from 20% of our range. It was like one shoe that was doing 40,000 pairs and the rest of it was doing 800 pairs per shoe. It was pretty shocking really. And people didn't realise that and it's very risky. Once that shoe dies you've got nowhere to go. What we've done in terms of bringing newness in and building momentum is that we've brought a shoe and said "right, this is working and these bottom three can drop out now". And we've done it gradually but now I would be disappointed if one of our models didn't do over 10,000 pairs.

Related improvements to portfolio productivity:

Sport-Two: Business Analyst

Range structure. This is what we've really tried to concentrate on, making sure the range is as tight as can be.

Reduction in product duplication and improvement in portfolio productivity:

Walk-One: Category Manager

In range structure performance I think we've made pretty good inroads and stopped cannibalisation. We've sorted out our architectures, we've got a segmentation model so we're not "killing each other". And we're looking at MOQs.

Related improvements to portfolio productivity:

Walk-One: Supply Chain Manager

Our productivity per SCO has obviously improved, so has revenue per SCO. I think there's still more and the openness to do that is there. So the analysis I did on this year versus last year, overall, our revenue per SCO was up by 13%. We would like to see that even more. As a result of the range building and the rationalization of it.

Reduction in product duplication and improvement in portfolio productivity:

Foot-One: Managing Director

We've had the most success with range building performance, just from the results that we've had. Which then links back in to reduction of cannibalisation and achieving minimum order quantities.

Related improvements to portfolio productivity:

Foot-One: Category Manager

Yes, but I think the important thing is that now everybody understands the impact of it. I think it's like with anything, you have to see it, you have to prove it. When we launched the major range and suddenly it was like over a third less in size than the previous range. And suddenly everybody was like "Woh! We can see the shoes now. We can see each one has a place, with categorisation and clear pricing". It took that whole cycle for people to understand what we'd been doing.

The range has become much more attractive to our target customer and consumer. The range is simpler. We stopped spreading ourselves too thinly, we made it a lot simpler. There is now a discipline in range structure and managing carryover styles.

Foot-One: Head of Supply Chain

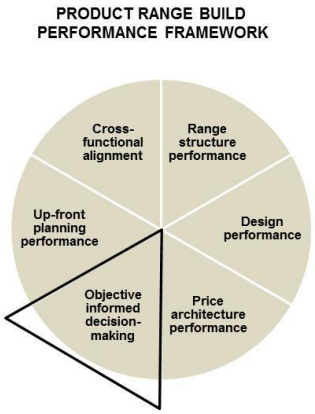
It's a lot better on range structure and design performance.

Related improvements to portfolio productivity:

Fashion-Three: Supply Chain Manager

In terms of the biggest change it's definitely in range structure. That's where it's had the biggest impact, on "the tail". In terms of the other areas there's an appetite to do it, an acceptance in the brand that there's more we can do. We're still at an early stage. What we've done so far is what we should be doing, so let's not congratulate ourselves with what we've done, we've got to a level where we should have been. We're still operating at a basic level. We've just recruited some more analytical resource which will make a massive difference.

OBJECTIVE INFORMED DECISION-MAKING



"Emotion" is better managed:

Sport-One: COO

We do have more objective decision-making, with the emotion getting taken out of it. We now have clear metrics so you can have "all the emotion you want" but the metrics show that product shouldn't be in.

Greater questioning is increasing confidence in portfolio development:

Sport-One: Business Analyst

The "objective informed decision-making" I think it has got better, we're questioning an awful lot more about what we're doing. Whereas before I think we were listening far too much to the sales territories. We were just listening to the loudest voices. Now there's a lot more of a financial element to it. The decision can't be just financial because of the nature of what we're doing but I think it's a lot more part of the process now.

Escalation of commitment is better managed:

Sport-Two: Product Category Director

I would say that the design performance has improved massively. I think the range structure performance has definitely improved. And the objective informed decision making has been vital to both of those because product, by its very nature, is subjective. For a designer it can be like taking their baby off them. And they've worked hard on that shoe and they truly believe that what they've done is right. Unless you have something you can hold up to say actually "for these reasons this doesn't work". Otherwise it's literally personal opinion and that's a very difficult place to be. A year ago the entire business was run on judgement, "is that a good shoe? Yes. OK, let's put it in the product range". And that's a dangerous place to be because you're not really controlling what is going out into the market. All you're doing is putting a shoe out there and hoping for the best. You can do that with part of your business but you can't do that with all of it.

Emotion and escalation of commitment is better managed:

Walk-One: Supply Chain Manager

We've moved on tremendously. Even just the sensible approach of it being more commercial and far more "head not heart". It used to be far too emotional and all these products pushed into the range that were not commercial enough to stick.

Foot-One: Head of Supply Chain

We definitely have much more objective informed decision-making.

Less reliance on judgement and "feeling":

Fashion-Two: Product Manager

I think on the objective informed decision-making we've gone from "black to white", in terms of our attitude towards it. Gone are the days where somebody had a "feeling" for a garment. The word "feeling" does not now exist in our current mentality.

Less emotion and more facts supporting product selection:

Fashion-Three: Managing Director

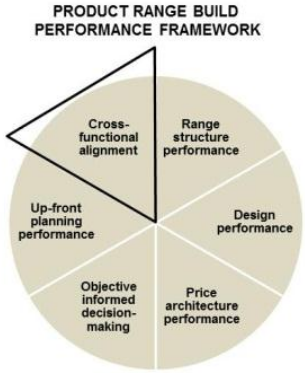
If the information is robust enough and clear enough, the people in the room are making the decision on the information and facts. The key has been taking the decision from being an emotional one to being a fact driven decision. Without the "intelligence" we've talked about you're going on gut. Without the "intel", you've got ten people in the room who'll all have a different opinion. You'll have five people who'll think it's great and five who'll think it's a waste of time and you end up leaving it in. And you end up potentially eroding the cash margin of your products. But you're more likely to make the easy decision, which is to leave it in.

Greater challenge is increasing confidence in portfolio development:

Fashion-Three: Supply Chain Manager

Yes, in terms of the objective decision-making. There are examples where we'd be sitting in a range review and some Salesperson will pipe up "oh that'll be a great seller, I sold loads of those last season". And when you look at the numbers they actually sold a small amount of pairs. It's having that level of facts to challenge the things being said. I've seen it in the past where a Salesperson would say something like that and everyone would take it as "gospel". The Design team would then go off and design a product around some anecdotal piece of feedback. Now it's got more structure and more objective challenging.

CROSS-FUNCTIONAL ALIGNMENT



Greater cross-functional contribution to the forecast:

Sport-One: Supply Chain Manager

Definitely the cross-functional alignment. What's driven it from my view has been the volumes. And the fact that the Categories weren't aligned with the rest of the business. They would say "This is what we can do this season". And we would say "You're not going to do that, and we don't trust that forecast, so we are going to change it". Now, we're all contributing into that forecast and what the range is going to deliver. The alignment has come from a common view of the forecast volumes.

Greater cross-functional involvement improving alignment:

Sport-Two: Product Category Director

I think now I'm much more aware of the end-to-end process of the range build. That it's not just about putting product in the right place. It's about getting Operations involved, getting Finance involved, getting Marketing and Sales involved. It's more cross-functional. Because otherwise all you're doing is putting more stuff out there. I talked about "skimming" with the range rather than going into "depth" and those shoes need to depict our global footprint as a brand. How do we put Marketing behind it? How do we make sure that the offer to the retailer is absolutely something that you can't refuse?

Improvement in cross-functional alignment around one 'picture':

Sport-Two: Business Analyst

Cross-functional alignment, hugely so. A uniform, one picture of the truth for everyone. This is what the productivity is, this is what the number is, this is how many pairs, this is the margin, volume and what we think it will be. So everyone is working from the same sheet.

More integration:

Walk-One: Supply Chain Manager

There is a far more commercial approach. There's more integration with the markets and understanding what the markets need. And creating a solution for that as opposed to trying to tell them what they need.

Improved collaboration and alignment on product selection:

Foot-One: Head of Supply Chain

The major difference has been that the original approach was just really done within the Product teams within a closed environment. And even though now it's still led by the Product teams it's much more collaborative than it was. The very big thing has been having Supply Chain as a senior voice around the table that's got some teeth. So rather than Supply Chain being the dogs over the wall that you chuck stuff to, and expect them to be able to manage on it, we are now at the decision table.

Definitely cross-functional alignment, that comes back to that collaborative thinking. Even though the Head of Product is still a big player there. He does make a big effort now to be aligned.

But the other thing internally I think it's important if you have more collaborative decision-making and you have more of a discipline I think people start working better, I think people step up to it a bit more. I think it sharpens everybody up. In a more performance driven culture. And also if you've got more analytics coming through, so looking at the information and saying "So what?". People are then much more interested in making the right decisions because they know someone's going to go "You know what, why did we have all those products in there?" They know there's going to be more scrutiny in what they do.

Greater strategic alignment:

Fashion-Three: Managing Director

Alignment of all of our functions. The alignment between Design, Supply Chain, our Asian teams, our vendors, making sure everyone had complete understanding of what their role was and responsibilities. Understanding who did what in the process

and what had to be communicated. So we were working as one team and you didn't have people going off and doing silo projects and other parts of the business later on struggling to meet what was needed.

If you look at where the real performance change has been driven is around the functions understanding the extended impacts of actions and therefore involving, working as one team rather than functions. No-one is making decisions in here without it being agreed across the piece. And a really joined-up approach to it. That had been one of our biggest issues, it was like herding cats, as far as products are concerned.

The heated debate is a positive thing but if we are, we're having it over the right things. In there we're much more aligned to the purpose and what we're trying to achieve with it. We're a lot more focused, we're a lot more aligned with what we want to get out of it.

These results, presenting perceived significant observed improvements in portfolio performance with changes in FAC levels, provides further evidence for the management perception that a change in FAC levels improves portfolio performance. This also provides evidence that management find the FAC Framework has practical utility.

4.2.1.1 Strategic Alignment

The results show, with informants from five of the six intervention cases, in the data on "cross-functional alignment", that there is more cross-functional involvement and alignment and increased cross-functional forecasting. The soft measure of "cross-functional alignment" is categorized by the cross-functional NPD management team being "joined-up at the big picture" and achieving a "balance of goals" across the different functional requirements. This data suggests that the NPD management teams perceive an improvement in strategic alignment.

In the next section, the results are presented where management perceive that there has been low, or no improvement in portfolio performance.

4.2.2 LOW / NO IMPROVEMENT

A summary schedule of the results, where management perceive low or no improvement in portfolio performance is presented in Table 17.

Only a small number of informants, from two of the intervention cases, noted soft measures with low or no improvement, for three measures; up-front planning performance (2 out of 13), cross-functional alignment (2 out of 13) and price architecture performance (1 out of 13). Data on these measures are presented in Appendix Z.

The low volume of data captured for these particular measures and the number of informants raising these measures as showing low or no performance improvement, suggests that management generally perceive an overall improvement in the soft performance portfolio measures, post intervention. This evidence further supports the first proposition and that the FAC Framework has practical utility.

4.2.3 OTHER OBSERVED PERCEIVED DRIVERS OF "SIGNIFICANT" PORTFOLIO VALUE IMPROVEMENT, NOT RELATED TO CHANGES IN FAC LEVELS

A summary schedule of the results, where management perceive improvement in portfolio performance from factors not related to any change in FAC levels is presented in Table 18. Managers observe other significant drivers of portfolio performance improvement, post intervention, that were perceived not to be directly related to changes in the use of FAC. These drivers of change were not controlled for in the study.

These other drivers represent limitations of the research design and methodology in this study for showing a causal relationship between control and performance, or the existence of a functional relationship. Management consider these additional post-intervention change drivers to have had a significant effect on performance. Supporting data on these findings are presented in Appendix AA.

Data on these improvements was captured in four cases, Sport-One, Sport-Two, Foot-One and Fashion-Three and from six of the thirteen informants. Only one observed other significant "improvement" was noted by more than one informant, that of the effect of "vendor relationships" on performance. The other ten factors were separate categorizations of improvement, captured separately from across the informants (Table 18). There was no data captured that identified a common "other driver of significant change" across all the cases.

TABLE 17 "SOFT" PERCEPTION MEASURES – LOW / NO IMPROVEMENT IN PORTFOLIO PERFORMANCE

"SOFT" PERCEPTION MEASURE	CASE	ROLE	NUMBER OF INTERVIEWEES NOTING LITTLE OR NO IMPROVEMENT (# / total interviewees)
Up-front planning	Sport-One Foot-One	Supply Chain Manager Head of Supply Chain	2 / 13
Cross-functional alignment	Foot-One Sport-One	Managing Director COO	2 / 13
Price architecture	Sport-One	Business Analyst	1 / 13

TABLE 18 OTHER OBSERVED PERCEIVED DRIVERS OF "SIGNIFICANT" PORTFOLIO PERFORMANCE IMPROVEMENT, NOT RELATED TO CHANGES IN FAC LEVELS

CASE	ROLE	OTHER DRIVERS OF PORTFOLIO PERFORMANCE IMPROVEMENT
Sport-One	Business Analyst	Understanding of margin
	COO	Product segmentation; Vendor relationships
Sport-Two	Product Category Director	Increased delegation
Foot-One	Head of Supply Chain	Critical path management
		Process of agreeing prices with vendors
		Finance team culture
		Governance on vendor selection
	Category Manager	New analyst in the team
		Organizational changes
Fashion-Three	Managing Director	Consumer insight
		Vendor relationships

One informant noted the significant benefit of a better understanding of margin. Introducing superior product and consumer segmentation is seen as a driver of portfolio performance improvement by another informant. The two informants noting the effect of changing vendor relationships describe benefits from ‘listening’ more to suppliers and ‘engagement ensuring the right relationships’ provides product improvement ideas.

Other noted significant portfolio performance improvement drivers related to vendors were; changes to the process of agreeing prices with vendors and on the governance of vendor selection. Organizational changes were also observed as having a portfolio performance improvement effect; changes in the supply chain process, finance team culture changes and investment in analyst roles. These last two factors possibly have an indirect relationship with the provision of new performance information, a key “event” captured in the next section when building the “developmental process map”.

The other changes captured as having a significant improvement effect were developments in critical path management and provision of new consumer ‘insight’.

These other drivers of significant improvement in portfolio performance, not related to changes in FAC levels and not controlled for in the research design, represent limitations of the design and methodology in this study for showing a direct relationship between control and performance.

The next section presents the empirical inductive construction of a “developmental process model” that displays how the change happened over time in the focal unit. The result and findings are additional evidence of NPD management teams changing FAC controls and observing changes in NPD performance. The process model also provides evidence that supports the two propositions and the practical utility of the FAC framework.

4.3 Developmental Process Model and Visual Map

As discussed in the detailed research design section, the process map is developed using data from both the interventions and the post cycle semi-structured interviews. The source of the data is identified for each “event”, whether intervention or interview. For the intervention the case descriptor is shown and for the interviews the

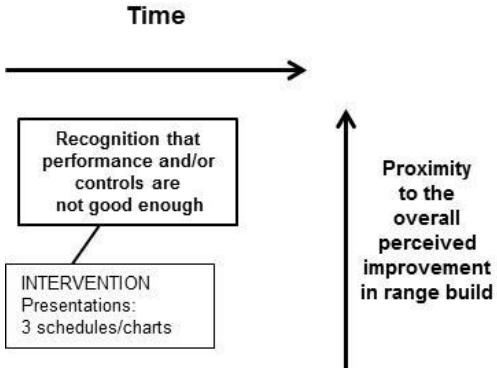
case descriptor and interviewee role are noted. Each stage of the process model development is shown in the developing visual map to aid understanding of each step taken with "mapping" the event coded data. The horizontal axis of the model is "time", post the intervention, and the vertical axis is the proximity of the event to management's final observed overall perception of the improvement in NPD portfolio performance.

The model, involving visual mapping of the data, is developed step-by-step from the coded data. There are 16 steps presented in developing the process model in the results. The first observed event, post intervention, was management's recognition that performance and controls were not good enough.

4.3.1 RECOGNITION THAT PERFORMANCE AND CONTROLS ARE NOT GOOD ENOUGH

A first impact of the intervention was management recognition that the extant management control of the NPD process was not good enough. Managers describe acknowledging performance issues, recognising low product productivity and not getting enough value from the NPD effort expended (Figure 40).

Figure 40 Developmental Process Model – Step 1



INTERVENTION

Sport-One Intervention

The decision on planned ranges is not getting feedback in time from existing ranges.

The brand range that is developed and launched is not getting seen in store the way the range was planned. The "go-to-market" isn't working.

The Product Category teams are getting frustrated with the effort involved.

There is not a look taken across all the categories, cross-functional working is not encouraged.

Step changes are required in range construct, product "fit" has too many blocks, there are too many new colours, too much complexity, product "trims" are "like a sweet shop" and we need to look at cash profit per SCO targets and reward.

The stage-gates are already there but not a real "stake in the ground". We need to get the "controls" more formally in the calendar. They're currently ad hoc and not aligned. There isn't enough of a formal sense check with a wider input.

People are starting to understand better the impact of poor decisions.

Fashion-Two Intervention

We also have a performance issue, people not able to design to a margin.

For me this is back to reality. It's clear, we're over-exposing ourselves for no reason. I'm putting workload on my team, I'm putting workload on the supply chain and I'm disappointing lots of people. I want to go to the Far East and say to people, "yes you've only got seven styles but you've got the exact volume that you had last time when you did fourteen". You're far more productive.

INTERVIEWS

Sport-One: COO

I think it was about the amount of cash tied up in stock and samples. And the time effort and resource going in for little value. We had no-one looking at the whole concept-to-launch. Everyone did their constituent part and did it as well as they could because we didn't have any parameters or frameworks in place for them to deliver against.

Sport-One: Supply Chain Manager

Some of the change was about "proving it with facts". We gave more challenge. The Category Management forecasts were driving a lot of actions and issues in Supply Chain and I said we need to work together on this because we're booking fabric and factory capacity. I knew it was the right thing to do. Everyone knew it was the right thing to do but it's just stepping out and doing it. I just don't like seeing things not done properly. What was happening was a waste of time, not adding value and driving a lot of wrong decisions.

Sport-One: Business Analyst

We had a lot of product that was pretty much doing nothing.

Sport-Two: Product Category Director

I think the key for me as well that when you work in product you get too ensconced in the day-to-day and the key thing that this encouraged me to do was to zoom out of the business a little bit and look across to see what we could achieve if we did things slightly differently. Particularly with the scenario planning and the forecast review. It flagged up that there are things I could be doing to reduce the level of risk of bringing in a new product.

Walk-One: Category Manager

Doing what we did a year ago is not good enough.

You could have said to us "everything you're doing is wrong" but you didn't. You're approach was "what you're doing is what you're doing but if we want to make it more efficient….I want to show you the way other people do it". I think that's a great way to then go "oh, we don't do it like that". If someone can run 10,000 metres five minutes faster than you and you went to watch them training. And you find "oh, I don't train like that". I'm going to change. And it's that moment, what triggers that moment. What is that trigger that goes, "you know what, the way we're doing it isn't right". But then actually within a seasonal process, what's the trigger to make you sit down and review and say "whatever has happened here isn't right, it isn't good enough. Let's just look at it, take stock and see if there's any way that we could have done it better". If there are a couple of lists of things that we could have done better, how do we apply it now?

Foot-One: Managing Director

The other massive realisation was that if we weren't category managing and controlling our options, I suddenly realised, we were also giving our vendor base an impossible task to service us efficiently. The amount of samples that they had to create in a short period of time. They were always under pressure. Which then creates an expectation with the factory that they've done all this work and they're going to get orders on everything. And then we come in and place 40% of what they've created on numbers, because we can't get anywhere near minimums on the other 60% of the range. So it wasn't all about making the SCO count more efficient for the market, it was about linking that directly into how we make that work at the back end with the vendors to then deliver that back into the business, to deliver to the customers, and improve our service levels. It was a big circle going round and round. At the time we were blaming the factories and actually, we were causing the problems from here and just throwing it into the factories and blaming the factories because they couldn't do the nonsense we were asking them to do.

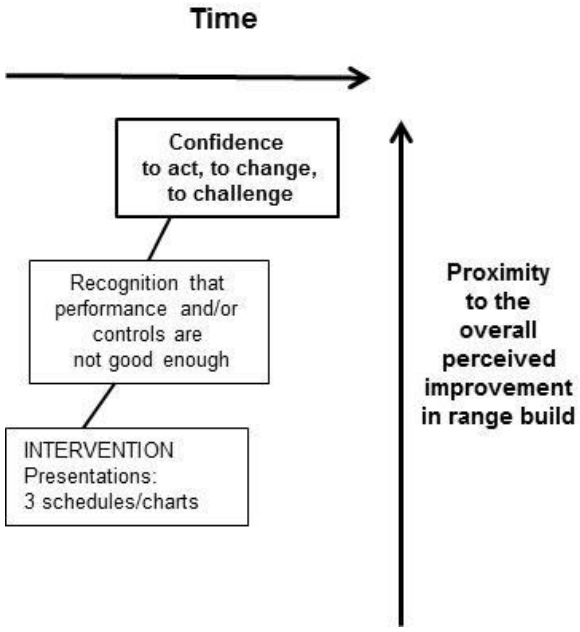
Fashion-Three: Supply Chain Manager

It brought into focus that a lot of what we were doing was a waste of time. People had been almost designing and developing product on a whim. It wasn't backed up with any kind of thought process about how much it can sell, who are we going to sell it to. What customers are potentially going to be interested in this type of product. It was a very basic range build background, it wasn't really being thought through.

4.3.2 CONFIDENCE TO ACT, TO CHANGE, TO CHALLENGE

Once management had recognised that performance and controls in the process were not good enough they found that the framework, and understanding how it worked, gave them confidence to act and make a change to how they managed the NPD process (Figure 41). Management describe how they felt 'empowered', how it increased confidence, that the framework became a 'reference point' and provided 'guidance'.

Figure 41 Developmental Process Model – Step 2



INTERVENTION

Walk-One Intervention

This is exactly what I need, the summary at a top level, where the opportunities are, where we need to do things differently. It pushes the lateral thinking. Where we can turn aspects to our advantage. Is it underperforming or not? Or where we are not looking at it in the right way.

The framework gave me a reference point. You gave me the confidence to do it. I wasn't sure how people would receive it. It's been a huge help.

It makes me think about the right questions to ask, to drive return on investment on these styles and drive volumes.

Fashion-Two Intervention

That's what I was thinking. I sort of feel empowered by this now. To me there's a lot of common sense things there. I've got the numbers down. I think we can go away and look at it. The key thing that we would also need to put together is price points where we start and where we finish. Taking it down to say twelve SCOs on jackets, two SCOs per jacket, it's only six styles. We need to be quite clear about where we start and where we finish.

I should be able to present back, in the final analysis, that every garment is absolutely there for a reason.

The tools and the information make sense to me. I'm much better prepared on how to achieve the target revenue for the season. It increases your confidence.

INTERVIEWS

Sport-Two: Business Analyst

It was the guidance, the support, the vision. Before you took me through this I felt that everything was very intimidating, there is so much information, you don't know where to start. No guidance, no framework, to see what I needed to do and if I was on the right track. What is of value, and what isn't. Having this lets you have that and see what I'm doing and what I need to do. It has given re-assurance and confidence. It keeps you on track and a belief in what you're doing.

Walk-One: Category Manager

It's having someone not involved in the process, recognising what you're trying to do. Benchmarking it against other people, giving you confidence. We could sit all day here as a business on our own thinking this is good enough. Whereas having an external person coming in and say "this is what other people are doing, I can see that you're trying to do the same thing but try it in this manner". I just think it's that, mostly it's been the confidence that the way we're thinking internally, in this cross-functional team.

Foot-One: Managing Director

It helped to change my confidence in doing something on it. It changed my confidence to be able to challenge in the business but more importantly it changed the confidence of the business because we started understanding it and seeing the results coming out.

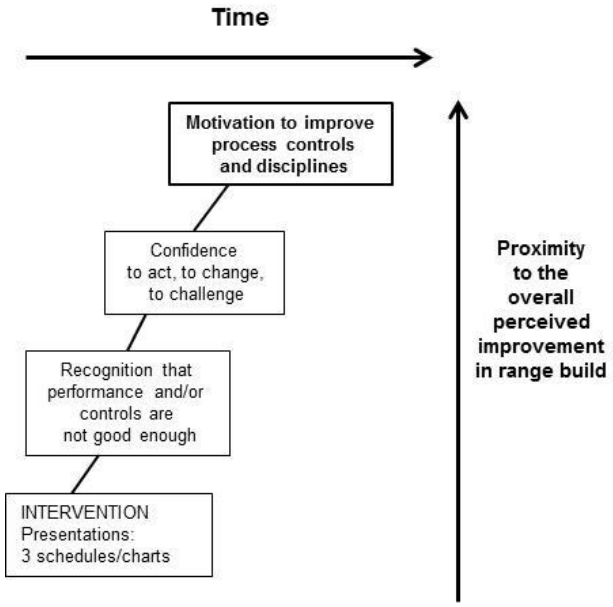
Foot-One: Category Manager

To have someone that actually understands, has experience and expertise, helped at the very beginning because it gave me the confidence and self-belief. It was a re-assurance as well. And I knew I could come to you and say "Here is where we are" and knew I needed to look at things differently. I knew you'd been researching other brands for best practice and tools and frameworks. It helps to just familiarise and the ladder can show where we are and where we're not ready yet. Where we needed to focus first.

4.3.3 MOTIVATION TO IMPROVE PROCESS CONTROLS AND DISCIPLINES

The confidence to act and to change appears to be closely associated with management becoming motivated to improve the process controls and the disciplines within building the NPD portfolio (Figure 42).

Figure 42 Developmental Process Model – Step 3



Managers describe how they and others want to improve how they manage the NPD process, to improve performance, also about their motivation to implement change in the controls and see the benefits.

INTERVENTION

Sport-One Intervention

The biggest win has been the Product managers now want to review with the Supply Chain team the forecast volumes at the start of the process and to do it together.

INTERVIEWS

Sport-One: Business Analyst

The real positive thing is from a Finance point of view we used to be called the "Margin Police" and now the Category Management actively want to do this because they don't want to be busy doing nothing. They want to improve the performance of the range.

Sport-Two: Product Category Director

So the scenario planning has given me clarity to my mind as to what could happen if we did things slightly differently but it's also been a motivation to action. And that's been the key thing for me.

Foot-One: Managing Director

It has gone from "out of control" to "under control".

These frameworks started the whole process. They put some disciplines into the business. It adds more value the more detail and the more expertise we have around this. But until this is put in front of you and you have an understanding of the basics, you can't move forward. When I look at where we were, with no measurement and being dysfunctional, moving slightly up this scale and putting some of these in has made an incredible difference on the performance of our business. It's getting over that hurdle of not doing it, to implementing something in your business, seeing the results and benefits. Which then means you have a hunger to build and build until you can get to the top when you get a strong and streamlined performance.

Foot-One: Category Manager

When we started of it was basic and we we're only reviewing the past, past performance. That seemed almost scientific to anybody else because we hadn't done that type of analytical review work ever. It was the forecasting elements that we needed to focus on.

Fashion-Three: Supply Chain Manager

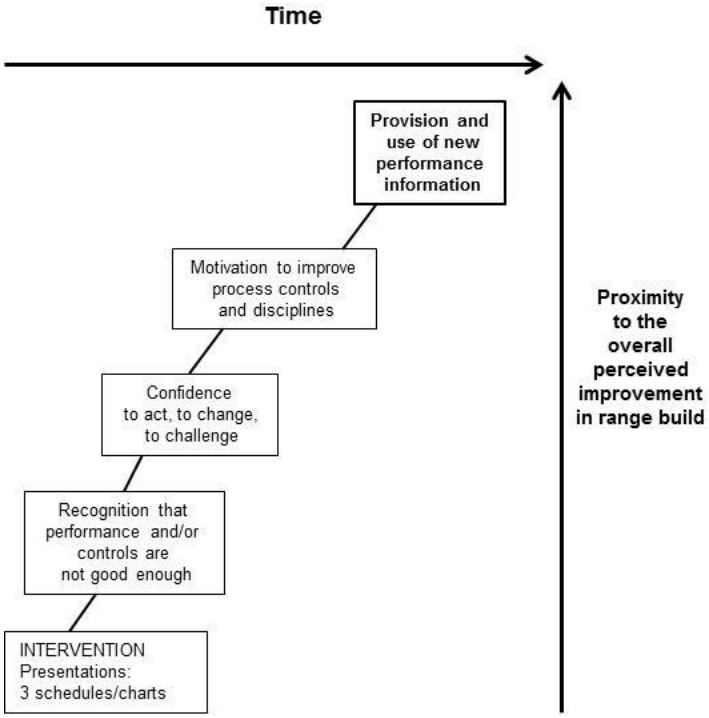
The key for me was getting the really senior people on board early. They got it quickly. To be fair, there hasn't been much resistance in the brand but having those

senior people on board early prevented any resistance at a peer level. The senior people almost mandated that we need to be tighter on this type of thing.

4.3.4 PROVISION AND USE OF NEW PERFORMANCE INFORMATION

When managers had the motivation to improve the controls a next step was to develop and use new performance information. The managers note how important and vital the new metrics, product 'tail' charts (example in Figure 44) and forecast margin mapping schedules, "quadrants" (example in Figure 57) are to driving change and challenging portfolio performance (Figure 43).

Figure 43 Developmental Process Model – Step 4



INTERVENTION

Sport-One Intervention

Visioning and high-level metrics is key, embed the numbers behind it and it becomes a very powerful document.

Walk-One Intervention

Focus on forecasting, where the sales will come from. Target sales per SCO is "reverse engineering".

We will want to track season-on-season by gender. Currently range category splits change a lot and overall SCO count is difficult to pin down.

INTERVIEWS

Sport-One: Supply Chain Manager

I think data drives a lot of it and the integrity of the data and having the most updated version of the forecast. And one version of the truth.

Sport-One: Business Analyst

The main one is the quadrant margin mapping. I think what appeals to people about it is you don't have to be a genius to understand it. It's quite straightforward. You don't have to look at a load of numbers to understand it.

Sport-Two: Business Analyst

We had more performance information and we challenged the business with it. The other piece of work that brought it together was making sure that everyone across the business understood where the range was going. It's bringing the control of numbers. In the past, anyone could run their own numbers. The danger of that is you can spin a number any way you want. Now there's one version of the truth, there is only one analytical function that is running the reports. This new analytical function is now established.

The most important to begin with was the database of information after each product buy, used by everyone. The numbers are broken down by productivity and with the quadrants that is more powerful, it's for the Product Directors, it's for the key decision-makers. It's had a massive impact on the range planning and building. It helps to initially see the history.

Sport-Two: Product Category Director

The most important thing for me is the availability of data. So data that I think I can trust is absolutely vital. I like the depth, in terms of SKU analysis, so in terms of pairs per SKU is absolutely vital for me in terms of efficiency. Being able to go "deep" on a particular shoe, working out why a particular shoe is successful. If we know it. Sometimes we don't know why it's been successful and we have to work that out pretty quickly.

In terms of the areas that I've used the most, the metrics has been absolutely vital for me. Knowing the data that I'm looking for means that I can be more objective over a longer period of time. If you measure the same things every single season

you know what's going on.

Walk-One: Category Manager

It comes back to change management with people. I had some of the biggest "run-ins" to try and change business plans to enable us to get information like this that would lead us to get decision-making that led to this performance.

Walk-One: Supply Chain Manager

Our productivity per SCO. The development hit rate. And reporting the measures.

The other thing is that in the early stages we look at a matrix, on volume, by SCO. It shows how many SCOs are in the plan against what's worked in the past. So what is the optimum number of SCOs depends on the forecast. So now, part of the process, at the "design sign-off" stage we use that information to say "You've got a forecast of 2000 units with six colourways, history tells us only four are going to work. Colour number one will be 1200, colour number two will be 800 and so on." The information tells us we should only put three colours into this product. There's more challenge.

Foot-One: Managing Director

The simple answer on what's changed is that now we're doing the maths on it.

I think the first and most important thing is we are now having a look at information. Two years ago we just created product and had a go at it. We weren't looking at the numbers.

Using information, because it drives all the others. It drives everything else. If you don't use the information and you don't do the analysis and you're not a 100% clear…..The information doesn't necessarily take stuff out. The information can actually replace stuff with things that you know you've missed or it helps drive your business forward if you can see the value in areas where you may need additional products.

Foot-One: Head of Supply Chain

And in terms of having some specific inputs from the Marketing team, who do a great job in collating information from various sources. And we're now also doing a lot more internal analysis now that we've got our business analyst on board. We're looking at what we've done previously. We've got standard seasonal performance review metrics and packs that we produce from a Supply Chain point of view.

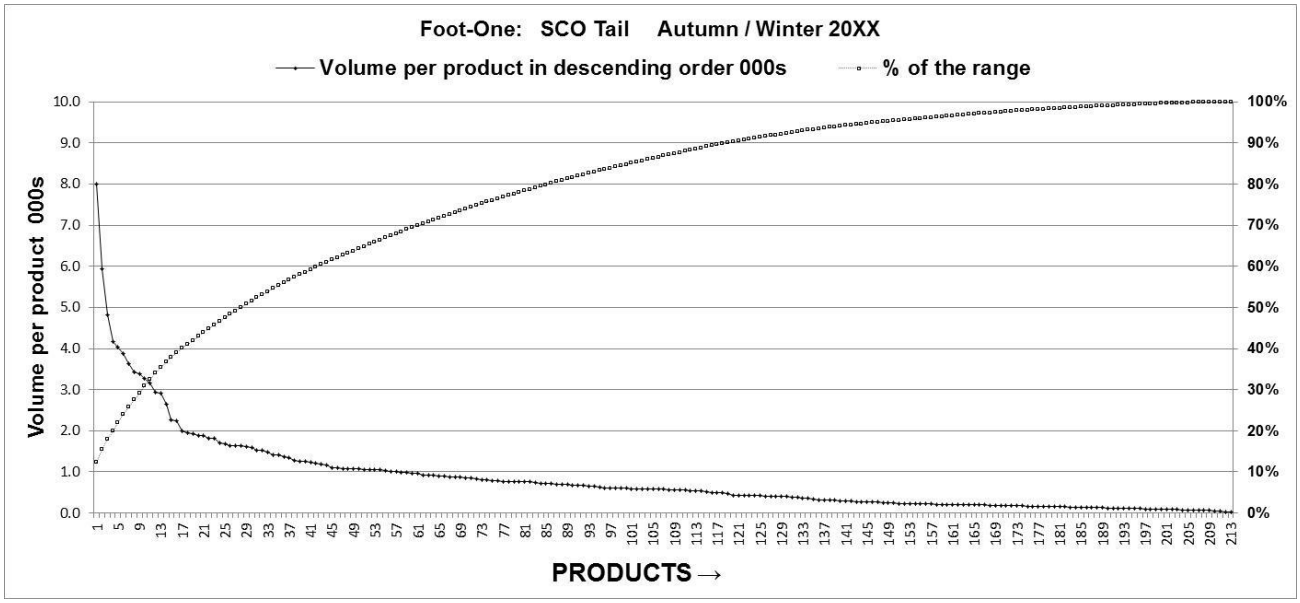
Fashion-Three: Supply Chain Manager

The first thing would be the tail analysis. That was the real starting point and

analysing it at quite a high level over the course of the season and year. It's really driving a value change in the business. It does illustrate at quite a basic level, for people who are not used to looking at 'business intelligence' in that way, or sometimes not used to looking at it at all, if you say you've got 300 SCOs and the sales value you are getting from that is €300k. They'll realise that's terrible. No matter who it is in the business they understand that. It does illustrate at quite a basic level, for people who are not used to looking at 'business intelligence' in that way, or sometimes not used to looking at it at all.

The next step was to look at it by age and gender. That gave us some interesting lessons as well, particularly in the female product offer. It was a very small amount of product that was driving it. The tail was more extreme, the tail was much longer than mens. And the hit rate was worse as well. It was brought into focus that the core product offer on womens was what was probably driving 95% of the business. The outcome of that is the product offer has been scaled right back. And will probably be scaled back more to be just a "core" offer for women.

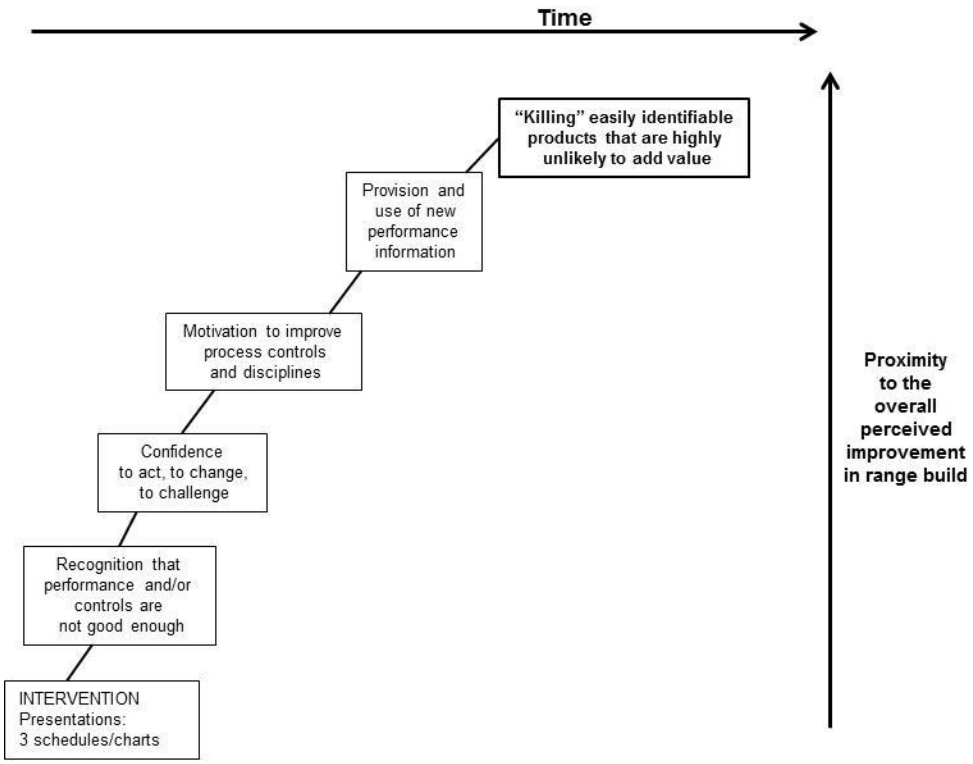
Figure 44 Foot-One "SCO Tail" Analysis



4.3.5 "KILLING" EASILY IDENTIFIABLE PRODUCTS THAT ARE HIGHLY UNLIKELY TO ADD VALUE

Managers describe, that with the availability of new performance information, they are more easily able to see the products likely to perform the poorest in the portfolio (Figure 45), those planned products that are highly unlikely to add value. Management have used the performance information to 'cut the waste out', 'get rid of the tail draggers' and remove the 'dross at the end of the tail'.

Figure 45 Developmental Process Model – Step 5



INTERVENTION

Sport-One Intervention

Category managers are making product culls before this early review meeting based on a review of the forecast and margin maps.

INTERVIEWS

Sport-One: Supply Chain Manager

We're trying to get to the point where the data is available and decisions on whether something should be in the range or not is becoming less of a "we do it now" because it is becoming more of an evolving thing. The obvious things that have to come out are spotted earlier, before review meetings. If you're more realistic at the start of the process, of the calendar, you almost don't start doing the stuff that doesn't add value in the first place.

Sport-Two: Business Analyst

The two biggest challenges and areas which brought our long SCO tail were carryovers and SMUs. By focusing on those we brought our tail down.

The "casual" Product team quickly got rid of their tail draggers.

Walk-One: Category Manager

I don't want to put unnecessary product into the line.

At the moment we're so SCO heavy we know we can cut 10% without much scientific approach. You look at your worst offenders. The ridiculous 10%.

Foot-One: Managing Director

If you're spending the same amount of time on the 50% of the stuff that's doing nothing and spend that time on the 50% that's doing something, you'll get more out of it.

The first one was that we didn't actually realise how many products that we were creating that didn't add value to the business. By reducing those collections significantly from where they were, the first one was "cut the waste out".

Fashion-Three: Supply Chain Manager

It's definitely the tail analysis. It's a starting point. It's at a very high level view. It's simple for everyone in the brand to understand. It's saying look at the product that doesn't sell, look at how much resource it's taking. I'm always quite conscious of using the right language in the meetings because if you're in a meeting with Product and Design I don't use words like the "dross" or "crap" at the end of the tail. The way I would I always say it is "this stuff at the end of the tail, we have to have a look at everything that's there and everything there should be able to justify its place". There should be a clear reason why that product is there. I think that's particularly relevant because now we've reduced the range significantly. We're doing the tail analysis on a much smaller range. There's a new tail because the bar has shifted up.

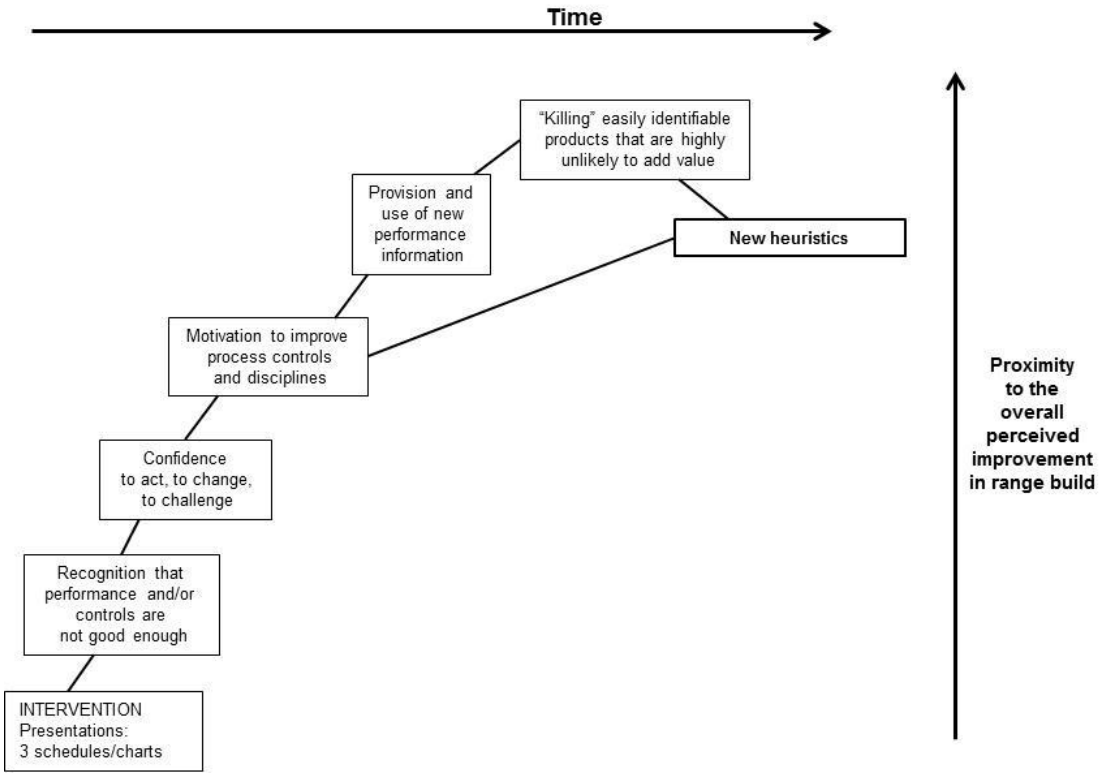
4.3.6 NEW HEURISTICS

Management now has new performance information that helps identify "easy to kill" product, during the stage-gate review. Management are also motivated to improve NPD process controls.

To reinforce these changes management has developed new heuristics (Figure 46). These new heuristics have been used to communicate, across their businesses, in a simple approach, the increased controls being applied to NPD portfolio management. These heuristics are; 'do less and achieve more', 'fewer, bigger,

better, ‘every product needs to sweat, if it can’t there’s no point in having it’ and ‘do less and do it better’.

Figure 46 Developmental Process Model – Step 6



INTERVENTION

Sport-One Intervention

The focus is still on doing “fewer, bigger, better”. To ensure the “better” gets delivered we are planning on more competitor product benchmarking, across the different consumer segments. Real competitive benchmarking will prove with measures that “better” is being delivered.

Fashion-Two Intervention

Do less and achieve more.

INTERVIEWS

Foot-One: Managing Director

If every product we do can’t sweat then we don’t do it. Every product needs to sweat hard. We have a little saying in here now “as long as every product can sweat then it’s worth being in the collection. If it can’t sweat, there’s no point in having it”

Fashion-Three: Managing Director

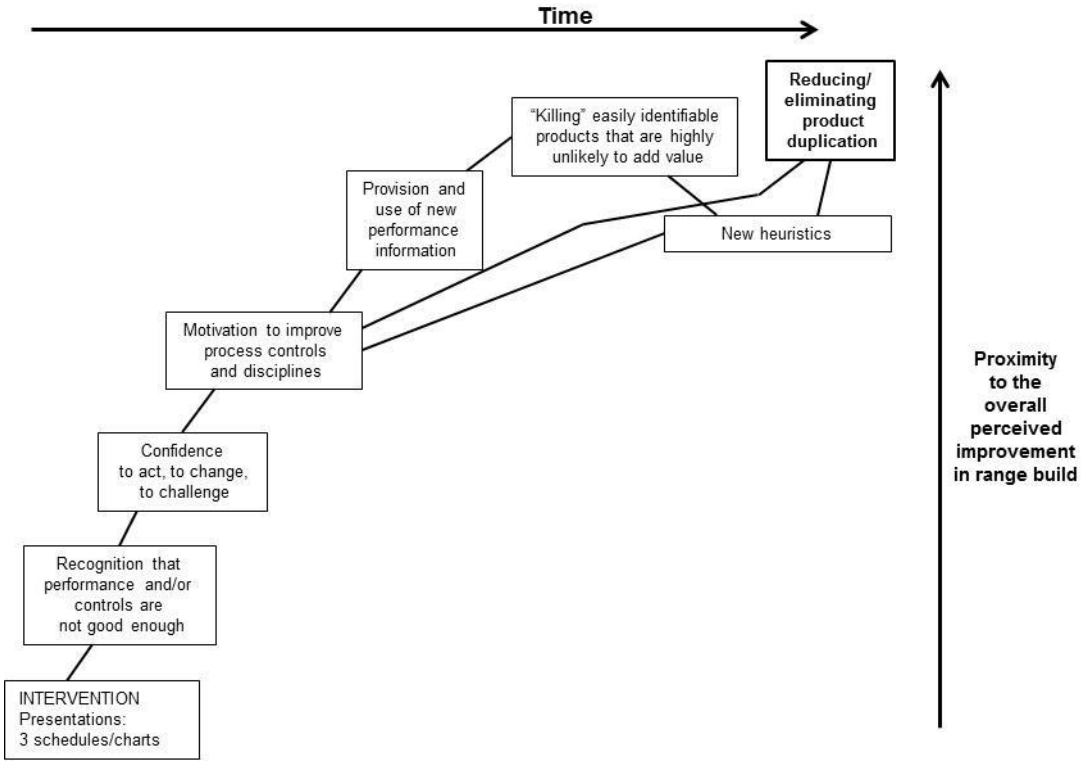
One thing that we've learnt over the last year particularly is "do less, do it better".

4.3.7 REDUCING / ELIMINATING PRODUCT DUPLICATION

The combination of managements' motivation to improve process controls and the new heuristics being used, led management to target the reduction or elimination of product duplication within the developed range (Figure 47).

Management recognises that when more than one product is 'doing the same job' in the range it 'dilutes' performance, is 'cannibalising' and reduces range efficiency.

Figure 47 Developmental Process Model – Step 7



INTERVENTION

Fashion-Two Intervention

The other thing I see as a massive advantage on here, when we get to the actual laying out of styles across the range plan, on any of these categories. Because

you've got the SCOs there, you'll have four pieces of knits for example, your good one, your two better and the best. And you're done. And there will be no splitting of these styles. If you look at the jackets we've got ten colourways at the moment, two colourways each, that makes only five jackets. With what we've got at the moment some are doing the same job, it's diluting what we're trying to do.

INTERVIEWS

Sport-One: Supply Chain Manager

The benefit of taking out the duplication is that it reduces cost and it's driving efficiency through the supply chain and the factories. We're now at a level where we can cash in on this production efficiency we're getting from the vendors. So where we were doing 2,000 units, we're now doing 5,000 units per buy and the factory efficiencies start to ramp up and we can start sharing the benefits.

Walk-One: Category Manager

Ratifying what you put in makes sense, not cannibalising, making sure the growth opportunity is really there.

Foot-One: Managing Director

Also to stop duplication. Again, really simply, we put the whole collection on the wall and asked:

"Does that do the same job as this other one?"; "Yes"

"Would you buy both of them?"; "No"

"Which one is the strongest option?"; "That one"

"Well take that other thing off the wall then! Because if we say we wouldn't buy that one over the other why is anyone else going to?"

To see which one is stronger. Which has to come from "intell" and analysis that we eventually started doing a year ago to understand what the drivers of the business were.

Fashion-Three: Managing Director

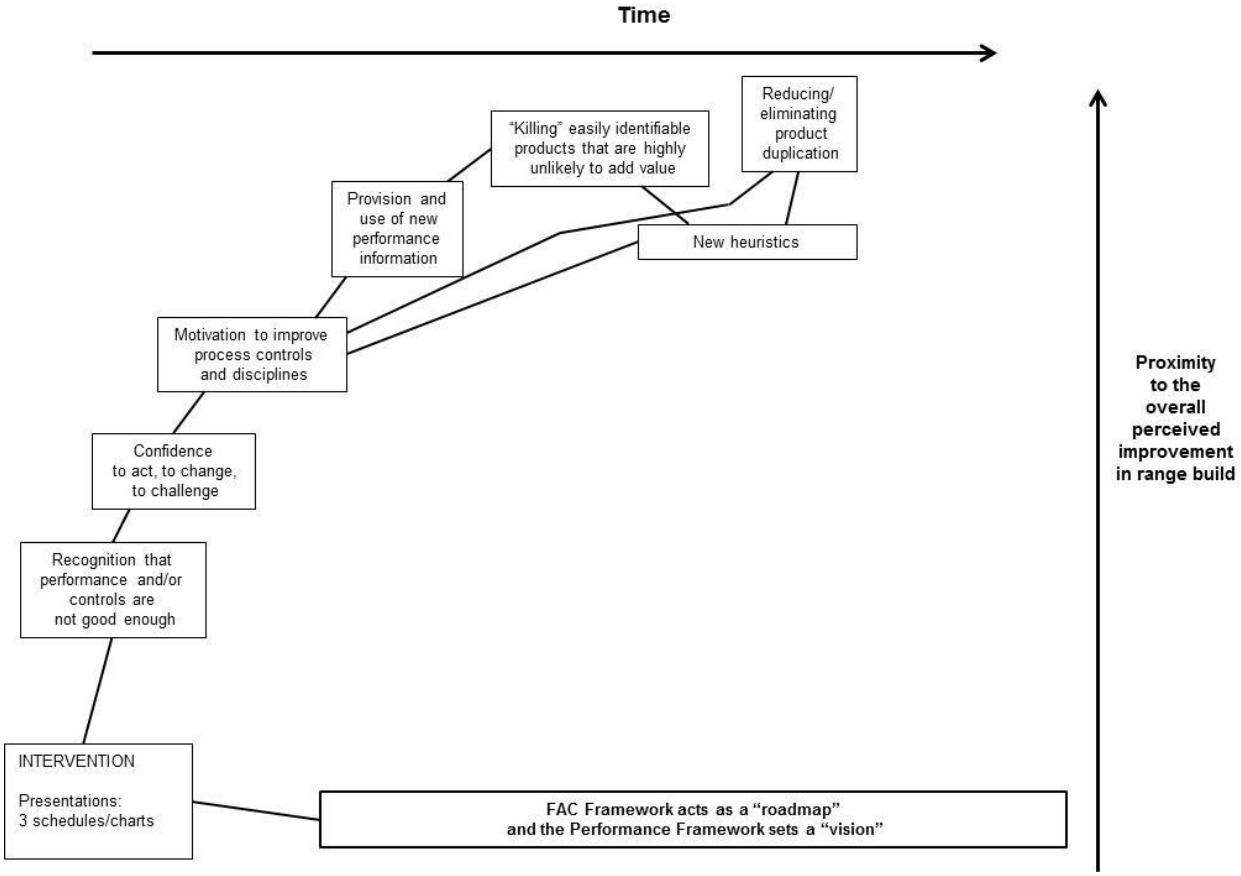
The other thing is duplication of product, the same product doing the same job. We've taken out a lot of duplication as well. So when you're asking what has reduced the range, there was a lot of duplication in there.

4.3.8 FAC FRAMEWORK ACTS AS A "ROADMAP" AND THE PORTFOLIO PERFORMANCE FRAMEWORK SETS A "VISION"

A different strand of change also took place immediately, or early on after the initial intervention. The observed change was that management started to consider the longer-term time horizons of the required control and performance improvements. These changes were considered by management as having more “strategic” implications.

Management describe the FAC Framework as providing a ‘roadmap of how to get there’, ‘it’s like a flashlight in the dark’ and that it is important for people to know ‘what good looks like’ (Figure 48). Managers note that the format of the FAC Framework helps them to consider ‘what’s next’, a ‘kind of guidance’ to ask ‘how can we take this to the next level?’.

Figure 48 Developmental Process Model – Step 8



This evidence indicates both the operational and strategic utility of the FAC Framework. The idea that the FAC Framework is acting as a guiding ‘roadmap’ has stayed in the “background” of management thinking all the way through the remaining process of change. This observation of the “strategic” utility of the FAC Framework also provides further evidence for the overall assessment of the propositions and the practical utility of the FAC Framework.

INTERVIEWS

Sport-One: Supply Chain Manager

You pulled me up a bit and dragged me out of the detail and allowed me to look at it in a different way. The [FAC] Framework has definitely helped give it more of a structure, a plan, "what's next", "how do we take this to the next level?". The great thing about the [FAC] Framework is that it gives you something to aim for. And if you're not sure what that is, this shows you what you need to do. And it'll drive the conversations that you need to have.

Sport-Two: Business Analyst

I have both these frameworks in front of me, on my desk. For me it gives a checkpoint of where you're meant to be. A kind of guidance. I like to see what the next thing is, why I'm doing something. Along the way some ideas work and others don't, like the factory level splits was useful for the Product team but not for me. Different people have different information needs. It's down to me sitting with the Product Director and finding out what he thought was useful and what wasn't. The control framework kind of gives you where you are and where you're heading to and it gives you that little bit of guidance, what's the bit that's missing and what do I need to do to get to the next level. It's like a flashlight in the dark. On the Performance Framework I keep on thinking what does this mean for us, where do we sit with this, what can we actually do that takes it on to the next level?

Walk-One: Category Manager

I feel that the Performance Framework is more of a visionary framework for me. I look at it and I am instantly very excited about what this brings up in my mind. The Control [FAC] Framework gives you the roadmap of how to get there. On the Performance Framework I think we're doing stuff in nearly all the boxes. If you were given this "pie" what is the segment you would start with, the most important? That's where I think the [FAC] roadmap links in.

Fashion-Three: Supply Chain Manager

I feel that there's a clear roadmap. There are clear next steps at every stage. "We're doing this now, what additional work do we need to do to get to the next level?" And they are sensible next steps. The intervention and the frameworks have made a massive difference. It's good for people to know "what good looks like". It has made a massive difference in trying to get things adopted. This has really risen up the priority list.

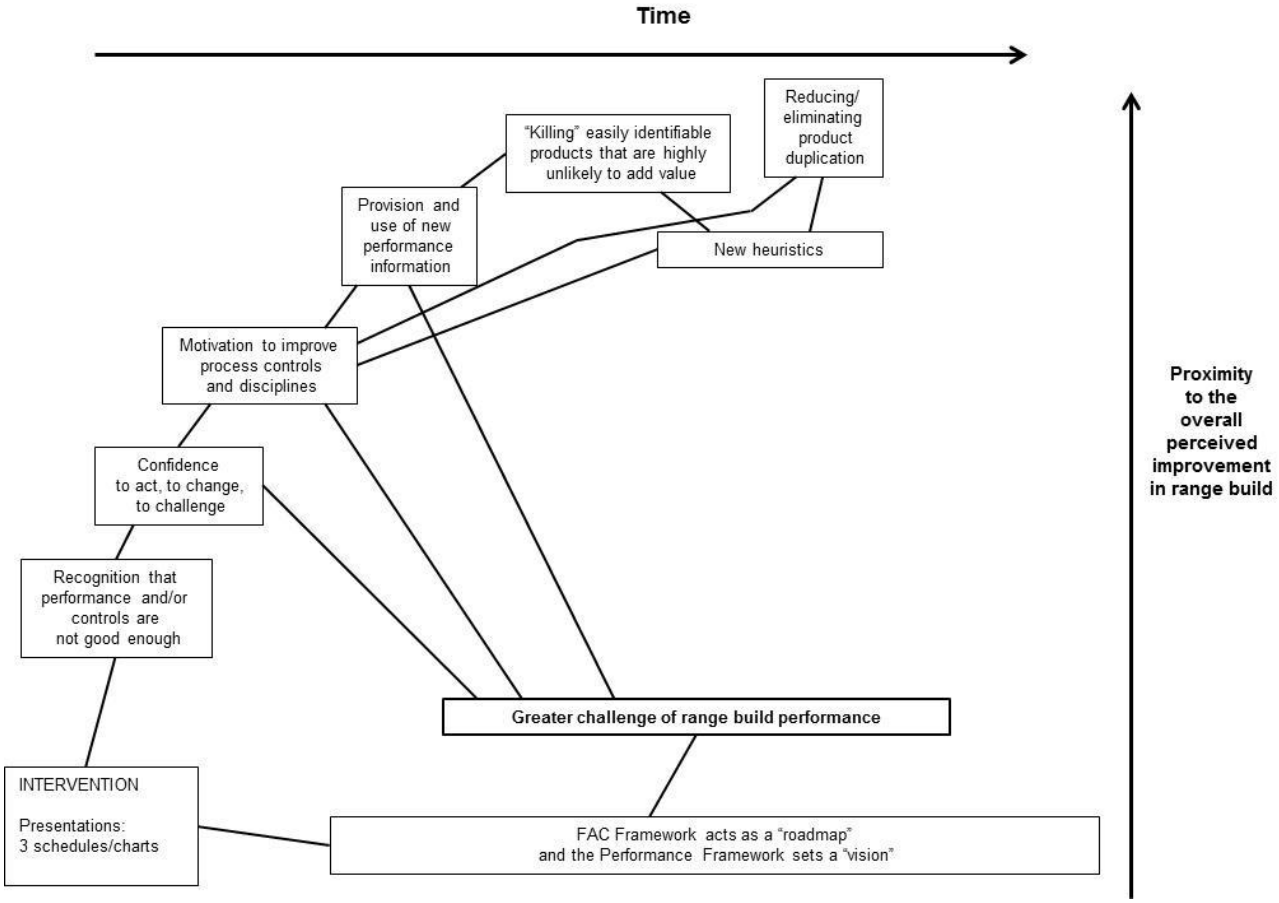
4.3.9 GREATER CHALLENGE OF PORTFOLIO PERFORMANCE

The next identified step in the process of change is the greater challenge of portfolio performance. Drivers of change include the combination of the confidence to challenge, the motivation to improve process controls and the provision of new performance information (Figure 49)

Management being aware of the guiding 'roadmap' role of the FAC Framework throughout the process also provided impetus for their greater challenge of portfolio performance (Figure 49).

This step in the developmental process model provided a significant amount of data from all the cases. During intervention the NPD management teams began raising many questions with each other about the range and product decisions. Management recognise they had not previously openly challenged each other on those concerns.

Figure 49 Developmental Process Model – Step 9



Examples of this captured change data, included in the data table below, are: 'if it doesn't add value, why is it there?', 'am I getting a balanced range?', 'we're questioning everything we do', 'everything is now under the microscope', 'we're trying to justify everything we're doing, at all levels', 'I give much more challenge in range meetings', 'understanding what the product is going to deliver', 'making sure we're developing the right products from early on in the process', 'we're taking a more rounded view on the range', 'we're starting to have a conversation about why we are doing certain types of product' and 'it forces a different conversation'.

INTERVENTION

Sport-One Intervention

We're sense-checking if it's still true. We become, or we don't become more confident. Therefore the forecast changes.

Walk-One Intervention

It helps ask "Am I getting a balanced range"? The new approach forced people to question the viability of the project. The shift is from trying to move away from what we need to do to what is the right thing to do, to think it through completely. Getting the marketing, brand and execution alignment. We are getting to think about market execution much earlier.

Fashion-Two Intervention

We have to get this right or we're going to go through the process, use too many or too little SCOs based on our target.

For me, going through the numbers, the word that keeps coming up to me is "simple", however it doesn't outline the much deeper bigger picture thinking "who's the consumer?". Why do we push that number of jackets?

If we're going to sell 61,000 pieces in Q1 are we actually targeting the right consumer? Is the lad that we're going after, is he commercially at a level where we can sell 61,000 pieces? My worry is are we going after someone a little too fashion, too niche? In which case it will only be 25,000 to 30,000 pieces. It's that real terracy pub football boy who we need to sell 61,000 pieces. Is it the lad we are all talking about as our punter? And I don't know the answer to that?

Because we've got too many options really for what we need. How good could a

trade show exhibition look with less pieces on it but just doing a better job with them? And it's still missing the business strategy. We can build a 150 SCOs to land a 127 and that's great, and we're tidying up our overdevelopment but it isn't telling me here's our punter. I'm still missing who that consumer is. Also is that volume target of 61,000 units right. How does that play on our overall business strategy?

It's making us as a team to focus, revisit, focus, revisit. We're asking "if it doesn't add value, why is it there?".

INTERVIEWS

Sport-One: Supply Chain Manager

With change also comes a lot of challenges. We had a lot of challenge trying to get the Product guys to see the benefit and value of doing this. It was almost like they were saying "what are you challenging us for because what we do is great". And then you provide the facts and the data to show "actually you forecast 200,000 units on these products and what we actually delivered was 50,000 units. You spent X, Y and Z on developing these products and the return has been negligible". This is the value we're trying to get out of this, making sure we're developing the right products from early on in the process.

We've got a process now. We're confident that the timings are right. And people have bought into it, so there's been a bit of a culture change. We're still a product led business but more things are being considered in the decision-making. We're taking a more rounded view on the range. There's just more being taken into consideration.

Sport-One: Business Analyst

In the main parts of the range that drive the business there is much more willingness from Category Management to actually engage in conversation about taking stuff out. "have we got too many products doing a similar type of thing?". "What is this going to look like at retail, when it's merchandised? We've got 300 products, how is that going to fit into 2m² ?". The whole way we look at it has made a massive difference. We are actually starting to have a conversation about why we are doing certain types of product. Generally the level of conversation is more around "Why are we doing this sort of product?", "Who am I going to sell it to?", "How much money am I going to make?", "What's the reasoning behind it". There are still some areas where we need to make bigger decisions on. Like "Should we do this product category at all?". That's not even from a range building point of view, like taking stuff completely out of the range. But the general level of conversation around range build and how we go about it is definitely so much better.

I think before there was just a massive amount of work that we were doing that no-one actually stood back and looked at it. We were just going from one season to the next, to the next. Like the use of the quadrants mapping. Even something as basic as that makes you go "Actually that's a good point, why do I do that?". And I can remember the Category teams first seeing that and almost like a light bulb going on in their heads. It forces a different conversation.

Sport-Two: Business Analyst

It's challenging getting people who aren't used to doing certain things and getting them to see value in it. And me now having much more confidence in pushing back and telling them the challenges they are going to face. It's these challenges that have taught me the most. It's a journey and a development. I'm now confident of that's what is right, or my conclusions of what's right.

Walk-One: Category Manager

Everything is now under the microscope. Checking the role of every product and not cannibalising. We're trying to justify everything we're doing, at all levels.

Sometimes, culturally, when someone steps up and sets parameters from a different area it can create tension, but I think it's really good. Planning can go to Product Management and says "you can't have four SCOs, you can only have three, because you're going to create too much stock for me". Because everyone wants to be more efficient and recognises the fact that if you're more efficient you can do what you have better and you'll get better quality product. And everyone is embracing it.

We've now got a culture where we're really keen to sit down and say "the latest season launched hasn't been perfect but let's look at what's not worked, how quickly can we apply changes to the other critical paths".

Walk-One: Supply Chain Manager

I think the biggest change in challenge is probably coming from an Operations point of view. Historically I've never challenged Product and Design at all. It's also coming from the top, with the new COO having been here 12 months.

There's more collaboration and integration, which didn't exist previously. I think the healthy challenge thing is critical.

Foot-One: Managing Director

I give much more challenge in review meetings. I always throw it back with questions. What? Why?

And we're reviewing seasonal sell numbers with the Sales team, presenting styles with good feedback from retail, our e-Commerce manager, feedback from there, our Supply Chain, Marketing and the Category Manager, all in the room. They all presented back. Two things came out of the meeting that was a surprise to most people, the first, a particular style that has sold out at retail. I'm then challenging back into the Category Manager how many options of the style we had for the next key season. She said two. I said "It has sold out at retail, that means there is a much bigger opportunity". She said I've looked at the system on what we sold into retailers and it "didn't warrant any more putting in". I said "But you're actually missing the point, on the intelligence we have now, it's sold out. We don't know how many we could have sold".

Foot-One: Head of Supply Chain

Even though the Head of Product may want certain things now in the range build we would then say "We strongly advise against that". We're challenging it much more, even if he still uses his key customer trump card, we still know well ahead what is required. And we're now planning for 15 styles, not 20 or 25.

We have certain gates that we take product through. So when we're sitting down and working out how much it costs us to include a certain colourway in the range because the Sales team will say "Let's keep the blue in". And now I can say "Actually, with the amount of samples we need now that's going to cost us €20,000 cash". We're challenging back and asking "Are you really going to sell the blue, or is it just going to divide the sales? Why can't we just keep the red and the green in?". We've got a lot more structured reviews to the range as it gets closer to launch.

We looked at sales but then we didn't say "So what?". We knew what was our best-selling line but no-one said "You know what, if we increased the margin by two points on that we would make an extra €100k". No-one said that "If we reduce the range by 30% we may increase SCO productivity by X". We had data but we didn't have any actionable information.

If we look at the situation with "womens", doing some of this analysis has got us to the point where we're not doing "womens" anymore. It's not only making sure you're producing the right product to sell, it actually stops you from producing the wrong product. It's actually the wrong product that holds you back and diverts your attention from the right product. The right product is always going to sell but you might be able to sell more of it if you weren't spending all of your time trying to make the wrong product work.

Fashion-Two: Product Manager

We are not busy fools anymore. We are a strategic thinking design team, questioning everything we do.

They now understand, even before they develop a garment, there is no point spending time working on garment that is clearly not going to sit within the parameters. There is a natural challenge, people seem to be becoming their own judge and jury. I hear them say, "but it won't make 400 pieces and it won't sell at that price?". It's a way of thinking, a way of behaving. It's got a sense of realism.

Fashion-Three: Managing Director

The challenge around delivery by SCO, what the SCO is going to deliver in that range. Also more around deliverables by SCO rather than it being in there for emotional reasons. Having a more numbers and financially driven approach, tied in with our market intelligence has made a valuable difference. Understanding what that SCO and category is going to deliver, so it's around that cash margin delivery.

Fashion-Three: Supply Chain Manager

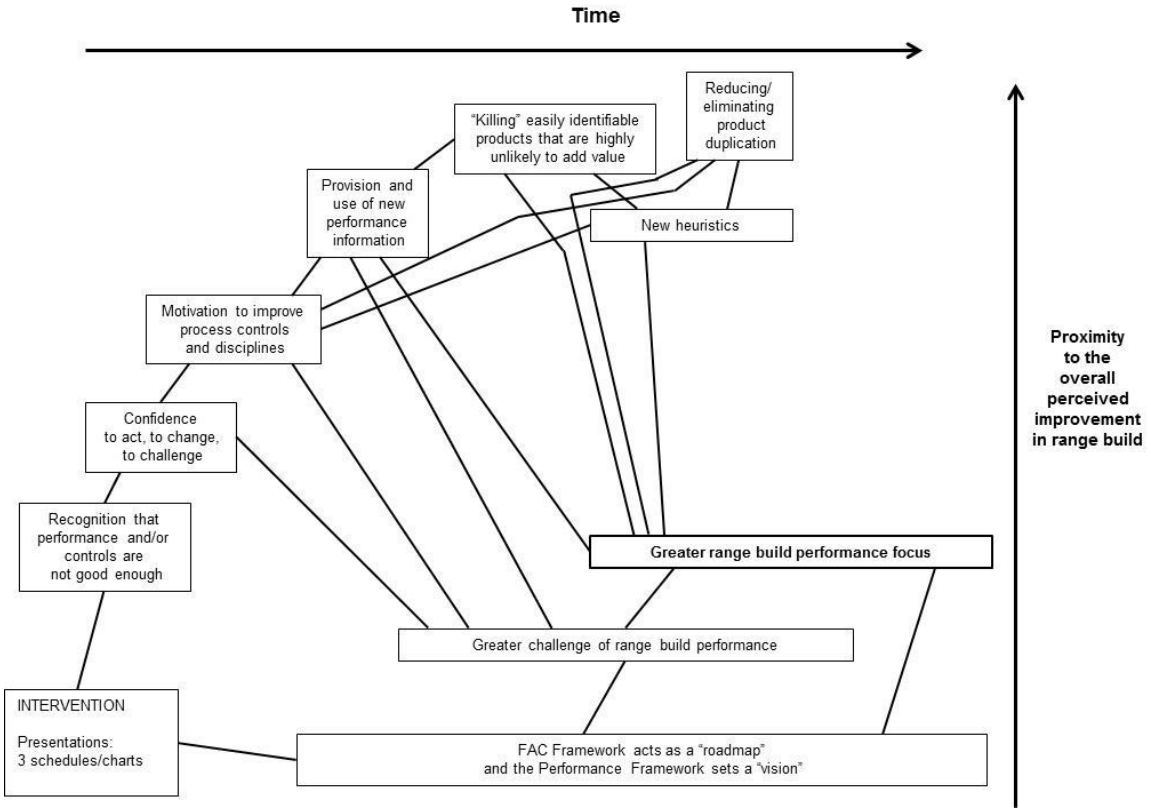
There is a bit of a disconnect in that a lot of the sales people are targeted on delivering a wholesale sales value rather than a margin. So it can drive the wrong behaviours with the Sales team. They'll go for the easy sale that drives the wholesale sale value rather than focus on the things that can deliver margin. So I put it very simply to the Sales team, "These are the margin rich products and you need to sell more of them".

4.3.10 GREATER PORTFOLIO PERFORMANCE FOCUS

The combination of the FAC Framework acting as a 'roadmap', the greater challenge of portfolio performance and the provision of new performance information led to the next change step, greater portfolio performance focus (Figure 50). This change also reinforced the management efforts on "killing" easily identifiable products unlikely to add value, the reduction of product duplication and the use of new heuristics (Figure 50).

Like the previous step on greater challenge of portfolio performance, this step also provided a significant amount of data across all the cases. The word 'focus' was prevalent in the data captured during and post intervention, as presented in the data table below.

Figure 50 Developmental Process Model – Step 10



Management discuss 'focused developments', 'less is more', 'focusing on what is right for the brand', 'avoiding over-development', 'not being busy fools', 'focusing on what's working and what isn't', 'thinking about the efficiency of the range', 'focusing much more on our weaknesses', 'doing less and contributing more', 'creating far less products, with bigger quantities behind the products', 'stripping out complexity', 'we stopped wasting time on projects that weren't going to get off the ground', 'stopping doing stuff that doesn't work', 'getting people to focus on the winners', 'less busy and more focused' and 'focusing the product range on something that works'.

INTERVENTION

Sport-One Intervention

She's really thinking about the efficiency of the range, tighter, more controlled, the physical structure of the range.

Walk-One Intervention

The team are now much more focused. They are looking more carefully at the

product. Is it right? Will it do the volume? Now I'm much more focused. The review meeting is now more of a sounding board than defending a position.

Focusing on what's working and what isn't and why it isn't working. Especially where you're not getting the incremental growth. This is the most focused relevant global range we've ever launched.

Fashion-Two Intervention

I think as far as focusing us it's really good that we've got some very nice round numbers in our minds. Less is more. It strengthens your message. Because what brands tend to do is they get the fishing net out and throw it as wide as they can and hopefully catch something. What this does is actually say, it creates a message, "this is our message". This is who we are. On bigger picture thinking. The less product you have, if you halved what we've got in the showroom now you'd have a stronger message.

What this is saying to me is "focus". Stop spreading the net, being a desperate housewife, trying to appeal to everybody. Focus on what is right for the brand. It's invigorating knowing we're not going to do something that isn't going to bear fruit. We're avoiding over-development.

Strategic range planning means you're not being busy fools. You can chop half the trees down and see the trees you really need to look at.

This is liberating because instead of firing lots of shots all over the place it's now one bullet that kills it dead.

Fashion-Three Intervention

Focused developments on where the biggest opportunity is, not the biggest challenge.

Avoid overdevelopment, focus Design resource and effort where it is critical to the plan.

INTERVIEWS

Sport-One: Supply Chain Manager

People understand it more now. Now it's completely different. They're coming up to us and asking when are we doing the forecast. It's completely flipped on its head. They've now been through a whole season and calendar of doing it and see the

value of doing it. It seems to have made everything a lot less busy and more focused. We're developing products that we actually believe are going to sell.

Sport-Two: Product Category Director

Reducing the size of the range has allowed us to take advantage of those opportunities, going deeper on models. We don't have as much stuff to do. So if there is a nice surprise, if you haven't got as much other stuff to do, you can actually take advantage of it. If you put it down to one or two key things, it's less stuff is absolutely vital. Focusing the product range on something that works. And then building a story around it or building a family of shoes around that one thing that works. That's been pretty key.

Walk-One: Category Manager

It helps me focus on getting the style stuff sorted out, efficiently and effectively. Next level is SCO analysis.

Foot-One: Managing Director

We used to invest 10-15 new kits per season. Now it's only 2-3. We make much better use of tooling, planned to last 3-4 seasons. After which we can use it for lower value MTO ("make-to-order"). We're expanding the lifespan of the products.

I feel like I do less and contribute more.

The other thing is the massive improvement in the product margin. There are two significant reasons why margin has improved. One, because we're creating far less products, so we're putting bigger quantities behind the products we are selling and placing with our vendors. Economy of scale means that we're much better positioned because we have an understanding, if we can put 10,000 pairs down that production line, we can keep it busy for four weeks. There's no downtime or line changeovers. It's more efficient, driving a lower cost from the vendor. The other reason is because we've got a significantly smaller range we can spend a lot more attention to detail. That cost we have from the factory, we can really break it down on the costing sheet. We can go back to the factory and challenge the materials, material usage and construction. "You're over-charging 30% on the material consumption on that's shoe". So our ex-factory costs are dropping just for the fact that we now re-engineer everything.

Fashion-Two: Product Manager

We now look at the top-line figure the department has to achieve. We look at historical data on achieved performance, across product categories. Also information on where we can expect to get the return on our top-line product. We look at the

"winners" and focus has been shifted from winners that look after themselves to the "losers", the weaker areas. I feel that now we focus much more on our weaknesses. And if anything, we attack them. It's not the good areas to worry about, it's about more focus on the products that are not contributing and dragging the margin down. In a nutshell it's about quality and not quantity.

We're not random anymore. We're not firing off a 12 bore shotgun with pellets going everywhere. It's one rifle shot, right in the middle, to the heart.

Fashion-Three: Managing Director

Get more out of it, don't add in complexity, strip complexity out. So although you see the new opportunity, rather than chase it, is "how do we integrate that into what works?". But recognise and adapt to that opportunity but without changing the process. The secret to great supply chain is reducing the complexity, strong processes and the right relationships from a vendor point of view, to do the job, before you commit to doing it.

We also stopped wasting our time on projects that weren't going to get off the ground. As well as looking at new opportunities, stop doing stuff that doesn't work. That was a big thing because the focus on doing what we did well and the distraction of chasing bits and pieces, taking out that distraction and focusing in made a massive difference.

Some of the historical "let's throw it against the wall and see what sticks" has been taken out because actually "we know that doesn't work".

Fashion-Three: Supply Chain Manager

It's clearly made a massive difference to profitability and the workload is far more manageable and is getting people to focus on the winners. At the same time we've found that we've saved a lot of cost by not developing things that are not go into production but at the same time from a customer perspective it's a much more focused offer. We don't split sales, it's more focused into things that are going to work. Rather than five different customers ordering five different things, with none of them hitting minimums and none of them going into production, they're focusing it on one or two products. It's made a big difference.

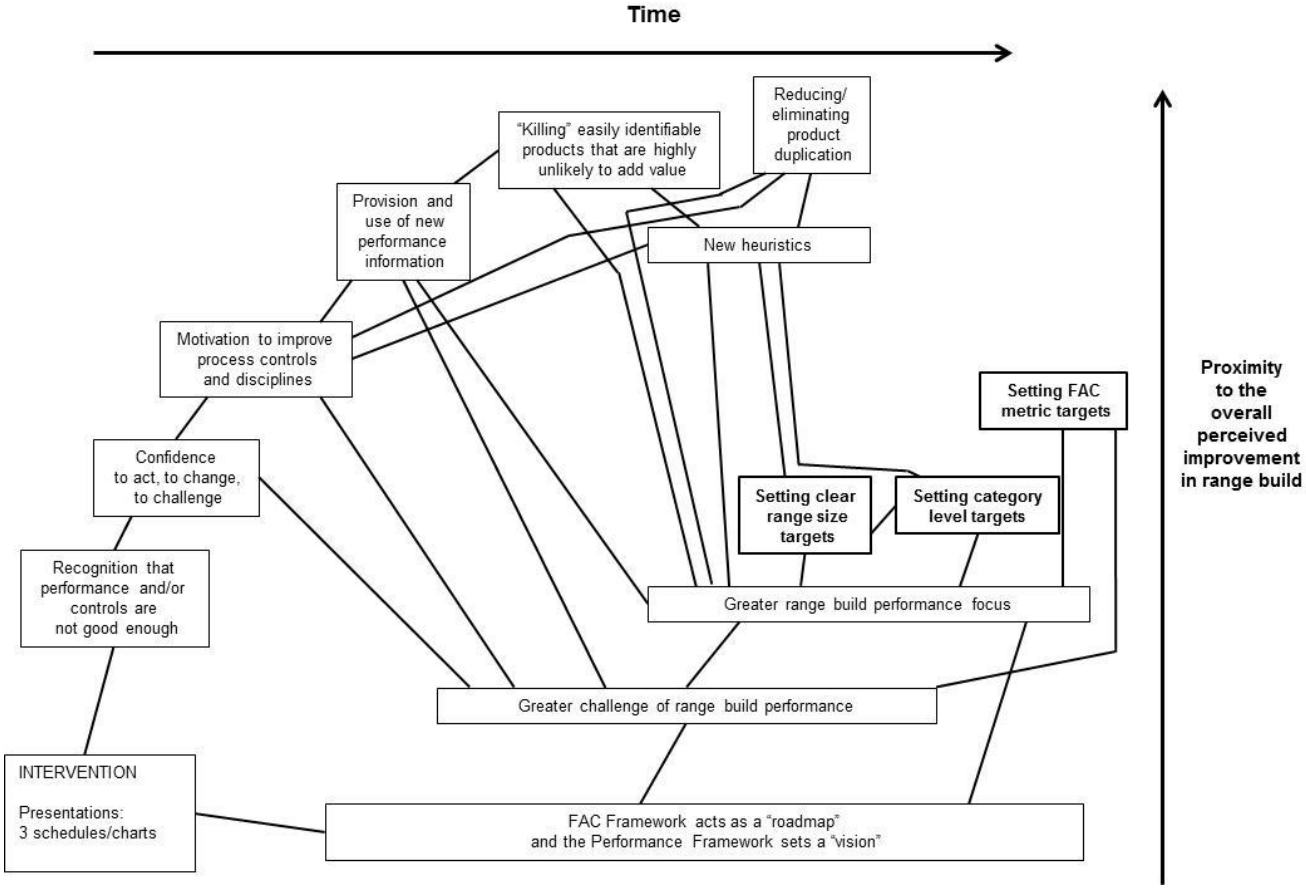
4.3.11 SETTING TARGETS; RANGE SIZE, CATEGORY AND FAC METRIC

The provision of new performance information including the tracking of measures on product volumes, revenues, margin and cash margin has been captured in the data

on the previous process developmental steps. This information includes new analysis, such as the SCO Tail analysis (Figure 44).

The tracking of measures by management, combined with the greater portfolio performance focus led to the next change step of target setting (Figure 51). This change was observed in most of the cases but especially the cases that were achieving higher levels of FAC sophistication, such as Sport-One and Sport-Two. Fashion-Three also showed some change in this area of development, notably on range and category cash margin targets.

Figure 51 Developmental Process Model – Step 11



The setting of targets was observed in three categorizations. Firstly, targets set on the overall range size, the number of products to be designed and developed. Management discuss getting 'the balance right', which appears to consider the "optimal" range size for balancing NPD and performance. The second target, identified in the FAC Framework as Level 2 (Figure 34), "Product category level forecasting and target setting", was also captured in the data. An example schedule from Walk-One is presented in Figure 52. In the data, management that has made

the change note an improvement in the management of the NPD process. The final target setting is categorized as FAC Metric targets, such as “volume per product” or “cash margin per product”. Sport-One has established these targets for all their product categories, in both apparel and equipment.

INTERVIEWS

SETTING CLEAR RANGE SIZE TARGETS

Sport-One: Supply Chain Manager

Having a more realistic number, a number with more credibility and belief. People believe it and it’s sensible.

Fashion-Three: Managing Director

We’re becoming much clearer on what the range needs to do and the range segmentation as well. Which area of the range is doing what. And with the financial insight we’re getting to a position where we’re looking at, before we start the range build, from a financial aspect, what are the expectations of a cash margin return. Feeding that into a model that has our range segmentation, some historical information and some forward forecasting information. If you put your cash margin expectation in there what it does is take your cash margin deliverable by category and drive out, in an ideal world, this is how many SCOs you should have going forward if you want to deliver that cash margin, from that category. But that’s a very financially driven model. That layered with the insight gives you the balance. It gives you that more robust, top-line, “we need ten styles in that category, at that price point, aiming at that consumer, in that styling”. And that’s really the goal. I’d say we’re 70% of the way there.

We’re starting to build up from the dissected view of margin. We’re starting to have that bigger picture of the absolute cash margin target from that range and asking how’s that going to come through.

SETTING CATEGORY LEVEL TARGETS

Sport-One: Business Analyst

I think by setting the targets by category we’ve made massive inroads.

Fashion-Three: Managing Director

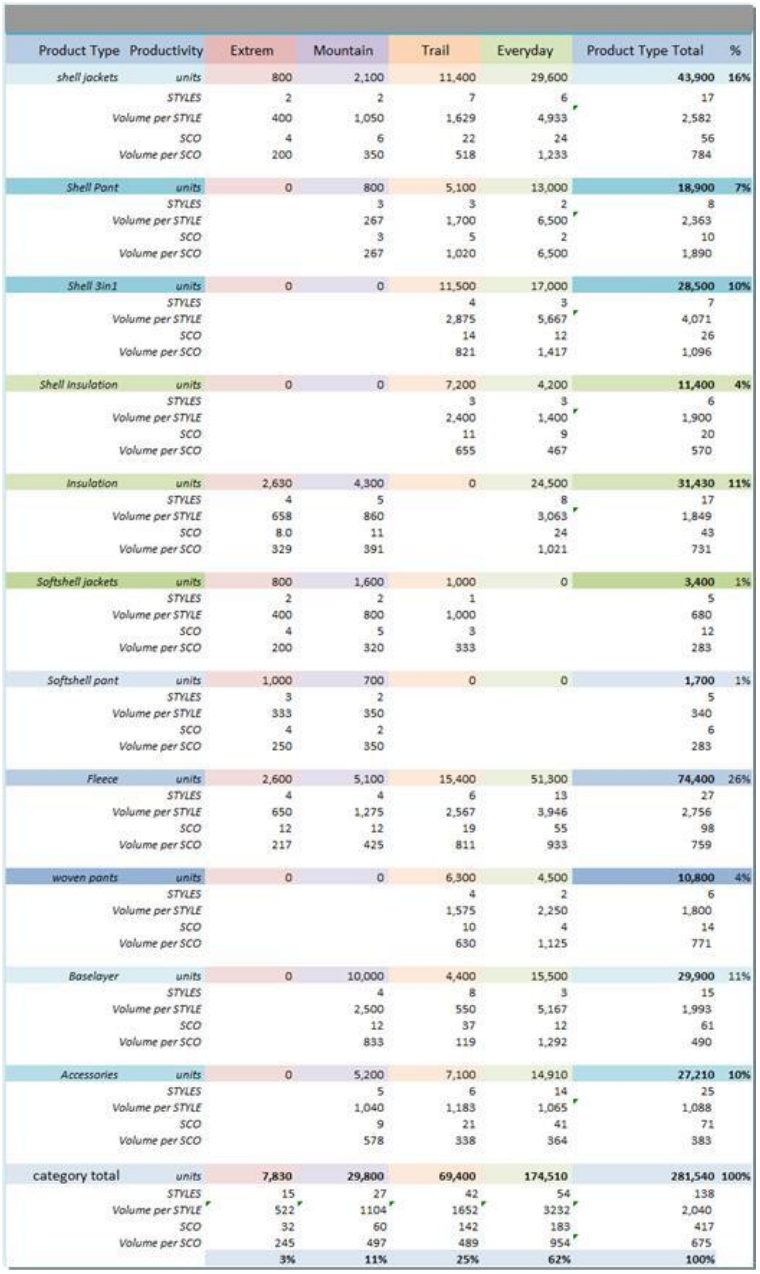
I want to walk out of the final colour sample review and know that the budget cash margin is guaranteed in this room and there is the opportunity to go above where I’ve budgeted.

FAC METRIC TARGETS

Sport-Two: Business Analyst

I am now able to turn round and say "That shoe will not give you the efficiency, it is going to cost you more and you're going to make less money. You're not going to sell as much and I don't think you need to do as many SCOs. Are you sure that's what you want to do".

Figure 52 Walk-One: Portfolio Category Targets Schedule



Product Type	Productivity	Extrem	Mountain	Trail	Everyday	Product Type Total	%
shell jackets	units	800	2,100	11,400	29,600	43,900	16%
	STYLES	2	2	7	6	17	
	Volume per STYLE	400	1,050	1,629	4,933	2,582	
	SCO	4	6	22	24	56	
	Volume per SCO	200	350	518	1,233	784	
Shell Pant	units	0	800	5,100	13,000	18,900	7%
	STYLES		3	3	2	8	
	Volume per STYLE		267	1,700	6,500	2,363	
	SCO		3	5	2	10	
	Volume per SCO		267	1,020	6,500	1,890	
Shell 3in1	units	0	0	11,500	17,000	28,500	10%
	STYLES			4	3	7	
	Volume per STYLE			2,875	5,667	4,071	
	SCO			14	12	26	
	Volume per SCO			821	1,417	1,096	
Shell Insulation	units	0	0	7,200	4,200	11,400	4%
	STYLES			3	3	6	
	Volume per STYLE			2,400	1,400	1,900	
	SCO			11	9	20	
	Volume per SCO			655	467	570	
Insulation	units	2,630	4,300	0	24,500	31,430	11%
	STYLES	4	5		8	17	
	Volume per STYLE	658	860		3,063	1,849	
	SCO	8.0	11		24	43	
	Volume per SCO	329	391		1,021	731	
Softshell jackets	units	800	1,600	1,000	0	3,400	1%
	STYLES	2	2	1		5	
	Volume per STYLE	400	800	1,000		680	
	SCO	4	5	3		12	
	Volume per SCO	200	320	333		283	
Softshell pant	units	1,000	700	0	0	1,700	1%
	STYLES	3	2			5	
	Volume per STYLE	333	350			340	
	SCO	4	2			6	
	Volume per SCO	250	350			283	
Fleece	units	2,600	5,100	15,400	51,300	74,400	26%
	STYLES	4	4	6	13	27	
	Volume per STYLE	650	1,275	2,567	3,946	2,756	
	SCO	12	12	19	55	98	
	Volume per SCO	217	425	811	933	759	
woven pants	units	0	0	6,300	4,500	10,800	4%
	STYLES			4	2	6	
	Volume per STYLE			1,575	2,250	1,800	
	SCO			10	4	14	
	Volume per SCO			630	1,125	771	
Baselayer	units	0	10,000	4,400	15,500	29,900	11%
	STYLES		4	8	3	15	
	Volume per STYLE		2,500	550	5,167	1,993	
	SCO		12	37	12	61	
	Volume per SCO		833	119	1,292	490	
Accessories	units	0	5,200	7,100	14,910	27,210	10%
	STYLES		5	6	14	25	
	Volume per STYLE		1,040	1,183	1,065	1,088	
	SCO		9	21	41	71	
	Volume per SCO		578	338	364	383	
category total	units	7,830	29,800	69,400	174,510	281,540	100%
	STYLES	15	27	42	54	138	
	Volume per STYLE	522	1104	1652	3232	2,040	
	SCO	32	60	142	183	417	
	Volume per SCO	245	497	489	954	675	
		3%	11%	25%	62%	100%	

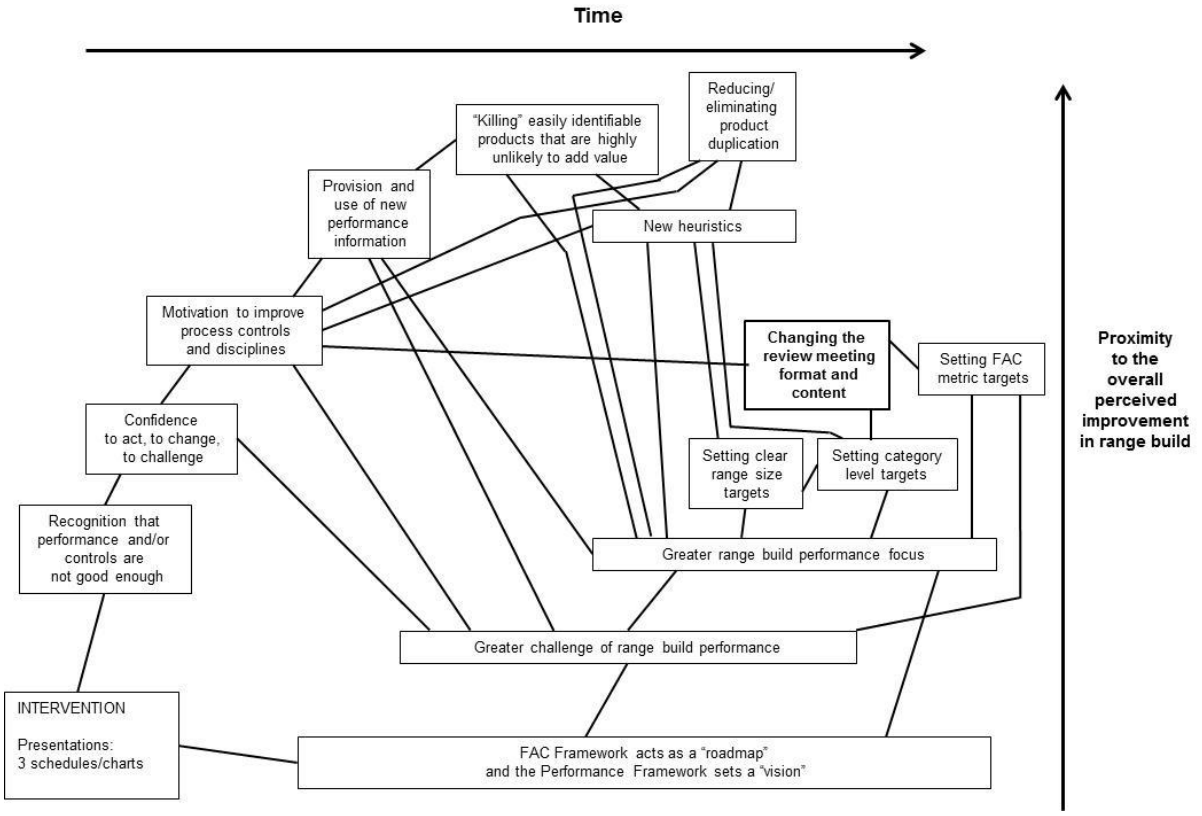
4.3.12 CHANGING THE REVIEW MEETING FORMAT AND CONTENT

With the motivation to improve process controls and disciplines, combined with target setting on range size and category level targets, management changed the review meeting format and content (Figure 53).

Fashion-Three note the change in the roles participating in the meetings, 'just having the key functional heads… making decisions around information, rather than emotion ….it's become a lot more focused in taking the tougher decisions'. Walk-One management observe the increased 'focus on preparation and content' with the result that the NPD team are more engaged in the stage-gate meetings. The Foot-One Category Manager describes how her role changed to 'SCO Controller' in the product review meetings.

The management approach to product and range forecasting became a key content change in the review meetings and is discussed in the next developmental step, step 13.

Figure 53 Developmental Process Model – Step 12



INTERVENTION

Walk-One Intervention

We are also freeing up capacity to do a much better job on fewer styles and improve margin. We are now focusing on the preparation and content of the review meeting. The team are more engaged.

INTERVIEWS

Walk-One: Category Manager

It is leading to the range planning process tool that I'm now creating, that at every stage, the meeting you're going to have, it needs to be clear who owns it, what are the outcomes of that meeting and how it delivers against the Performance Framework.

Foot-One: Category Manager

Fundamentally I became the SCO controller, to justify and say how many options. To explain and show why we needed to cut back, that we're not making any money. "Keep it small and let's see how many pairs we can get from that much smaller range". And suddenly we're going from 300 pairs per product to 600 to a 1,000 and 1,500. To have control we've got a range plan. "If you want to put more shoes in, it'll be at the loss of something else".

Fashion-Three: Managing Director

We've also changed the team involved in those conversations. We used to have a lot of people involved in it. We've reduced it now to a core team who are making tougher decisions. And taking some of the emotion out of those decisions. You know, we're a fashion brand, there's a lot of emotion tied to product, it's not tins of beans. And we're a product focused business, that has to be our focus. So without the "intelligence" that we're talking about there's a lot of emotion and gut feel that the decision is being made around.

It's taking emotion out. In our review meetings we had a lot of decisions around what people like and don't like, whereas now we've reduced the people in it. Just have the key functional heads in that meeting, so rather than ten people in it we now have four, who are making decisions around information, rather than emotion. It's become a lot more focused in taking those tougher decisions.

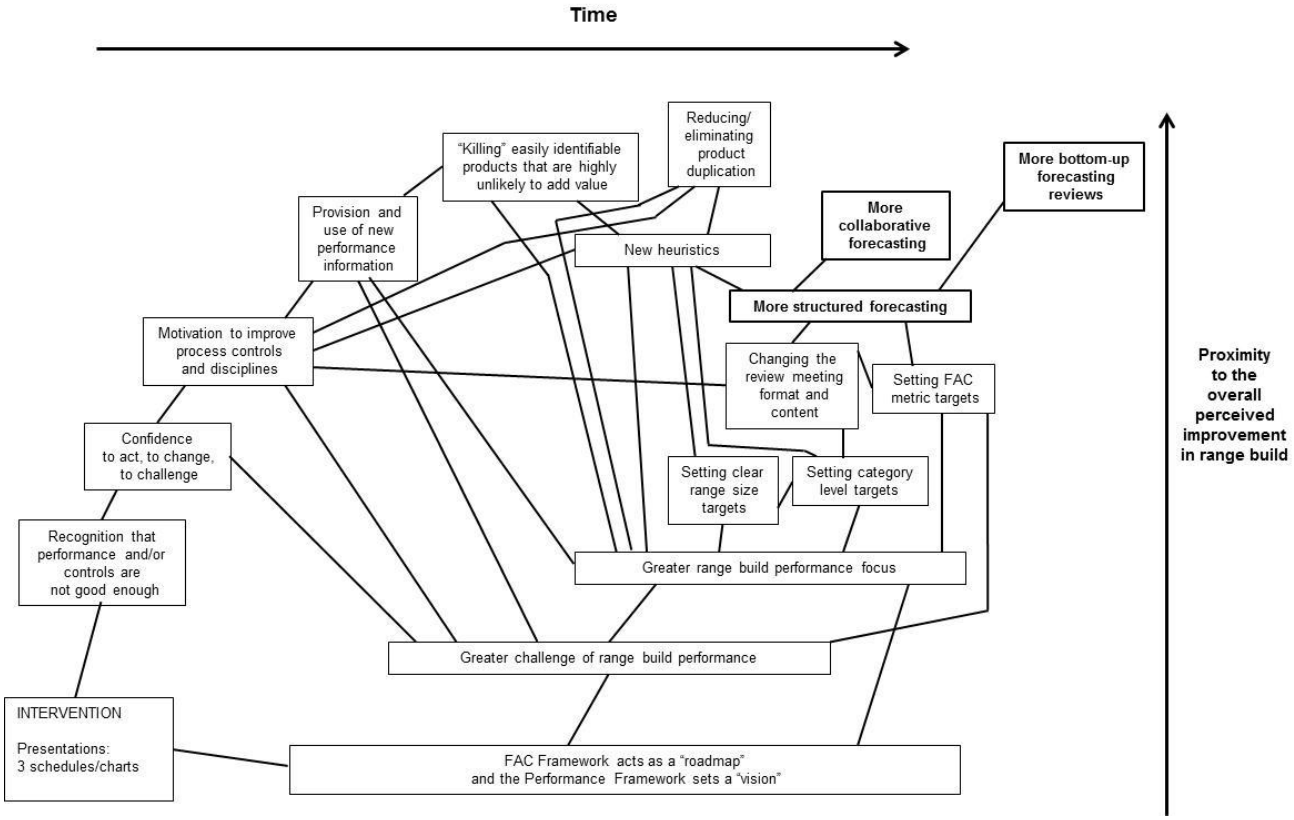
4.3.13 FORECASTING: MORE STRUCTURED, MORE COLLABORATIVE AND MORE "BOTTOM-UP" FORECASTING REVIEWS

As noted in the previous sub-section, the management approach to product and range forecasting became a key content change in the review meetings. A significant amount of data was captured on this forecasting change and observed by all the managers in supply chain roles in the intervention cases.

Three categorizations of forecasting are coded from the data (Figure 54). Firstly a more structured approach to forecasting. Informants describe ‘in the past there wasn’t a lot of science applied to forecasting’, ‘forecasting has changed totally, we had no forecasting at all’ and ‘we were doing nothing on forecasts 18 months ago and now we are doing something, that’s got to be good’. The new heuristics, driven by the motivation to improve process controls, also influenced the development of more structured forecasting (Figure 54).

The second categorization, driven from more structured forecasting is more collaborative forecasting. Management note the change in the group of ‘stakeholders’ involved in the forecasting process, that it is a ‘joint approach now’, with ‘buy-in’, ‘cross-functional team forecasting’ and a ‘more collaborative approach’.

Figure 54 Developmental Process Model – Step 13



The final forecasting categorization also driven from more structured forecasting is more "bottom-up" forecasting reviews. Pre-intervention Sport-One only had one forecast built-up from product level, with volume data input from Product Management only and now Sport-One has three of these forecasts prior to launch, reviewed cross-functionally (Figure 55). Walk-One describe new re-forecasting at second prototype stage and Fashion-Three are now doing 'two bottom-up forecasts before launch'.

INTERVENTION

MORE STRUCTURED FORECASTING

Sport-One Intervention

We check actuals versus plan on forecasting but this can be too late at this point. We need to risk assess the forecast during the process.

MORE BOTTOM-UP FORECASTING REVIEWS

Sport-One Intervention

For next season, starting now, there will be five forecast reviews, of which three will be before launch.

INTERVIEWS

MORE STRUCTURED FORECASTING

Sport-One: Supply Chain Manager

The first thing was forecasting and looking at the forecasting process. And when forecasts are needed and what they're needed for. Once we'd established that we've now got five formal points in a seasonal calendar where we reforecast.

The forecasting is also starting to evolve as well. So we're not just looking at the current forecast, we're also looking at how the forecast has changed throughout the process. So what did we start off with in the range and what does it look like now?

Sport-Two: Business Analyst

I think it's a different world now to what it was a year ago. The thought process that goes behind every aspect of what we do. In the past there wasn't a lot of science applied to building a range or forecasting. It was very much everyone was sat in silos. There was little analysis of what was happening. There was no real

forecasting. To begin with we started looking more at history, building a database of performance. We were analysing best sellers but our new business "suite" allowed us to look at the productivity of the best sellers.

We now do post reviews of the forecasts to see how everyone has tracked against the forecast. It's not to tell people off, it's to get an understanding of how much reliability we can put in the forecasts. It's early days but it's getting better each quarter. It's really interesting that now there's no push back at all from Sales.

Foot-One: Head of Supply Chain

Our forecasting has changed totally. We had no forecasting at all. And then we basically brought forecasting in, in stages. So we started off with a "Post Launch" sales meeting, where we went through some basic forecasts. And we've turned that forecast into a "demand" plan. And now what we're doing is bringing forecasting in at a Product Group level right at the beginning of the range plan. And as we take the range plan further off towards launch we get it to a more and more granular status. So that we can then start turning that forecast into a demand plan, and then into a capacity plan, which we can communicate to our vendors at different points during our cycle.

Fashion-Three: Supply Chain Manager

I think the fundamental question I put to my team is what we need to understand is to understand the demand. Where's it coming from, which customers, which territories, which products? We need to understand where it's coming from in the first place because without that we can't constructively challenge the forecast. Without the challenge throughout that process, unless we're armed with a bit of intelligence to challenge it back, we could be planning on a completely wrong number. Whoever is managing the forecasting process has to understand the demand.

We were doing nothing on forecasts 18 months ago and now we are doing something, that's got to be good. Realistically it will take us three or four seasons, or more, to get us where I'd like us to be. A lot of that is around educating the Sales team and the people providing the forecasts in the first place. We have to demonstrate clear benefits to them of doing it.

MORE COLLABORATIVE FORECASTING

Sport-One: Supply Chain Manager

The process now is that we have a group of stakeholders, Supply Chain, Product and Finance that feed into the forecast. It's still evolving, now we're also looking at how we build in market inventory, we're looking at stocks in different countries. Also

how we get feedback from markets at these initial stages. The key internal stakeholders feed on to the forecast right from the very start of the process. So after the planning has been done and the range has been initially defined that's the first time we all get together and create a forecast.

Sport-One: Business Analyst

Before it was almost like we were the "enemy", the "margin police", coming round here saying we can't do this product because it doesn't make any money. But "You don't know anything about colour". There was almost a bit of friction. Now I think we're part of that process and also the Category teams see us as people they can come and ask for help from. I've sat in meetings previously where it was certainly "emotional". Now we're more objective on what the product is actually doing for the business.

From the rest of the business there isn't the argument between Finance and the Category teams anymore. It's a joint approach now. Finance forms part of the decision-making and the Category teams say you are welcome to come in and help us. And that's a massive change. And Finance are now realising that Category teams had been making decisions with the best information that was available at that time. There is now buy-in from both sides.

Sport-Two: Business Analyst

We also went to the Sales team and asked them for a detailed forecast. In the past we wouldn't have got a forecast from Sales at all. They would just attend a meeting and say whether or not the line plan looked good. And that was a huge challenge because it takes a lot of time and they don't see the value in it. So there was an education piece of showing the impact it was having on factories and the peaks and troughs of capacity planning. Now, for each quarter, the majority of our distributors we show them every shoe that's going into the range, what it did last year for their territory and ask what do they think it will do this year. Forecasts are sent back, consolidated and sent back to the Asia sourcing operation.

Walk-One: Category Manager

I think the other big step we've done more as a cross-functional team is that forecasting process, where at Design sign-off we've placed a forecast. We've seen a cross-functional "stepping up to the plate" on this, across Product, Supply Chain Planning and Design.

Walk-One: Supply Chain Manager

We now have a more collaborative approach to agree on what the final forecast is that we're going to "lock-down". Because what I found was I had to step in the middle

and say "Your forecast is wrong. If we work together we might reduce how wrong it might be".

MORE BOTTOM-UP FORECASTING REVIEWS

Sport-One: Supply Chain Manager

There are three up to launch. Previously there was just one forecast done at the start which took us all the way through the process. This was only done by one person, or one frame of thought, just from one angle.

Walk-One: Category Manager

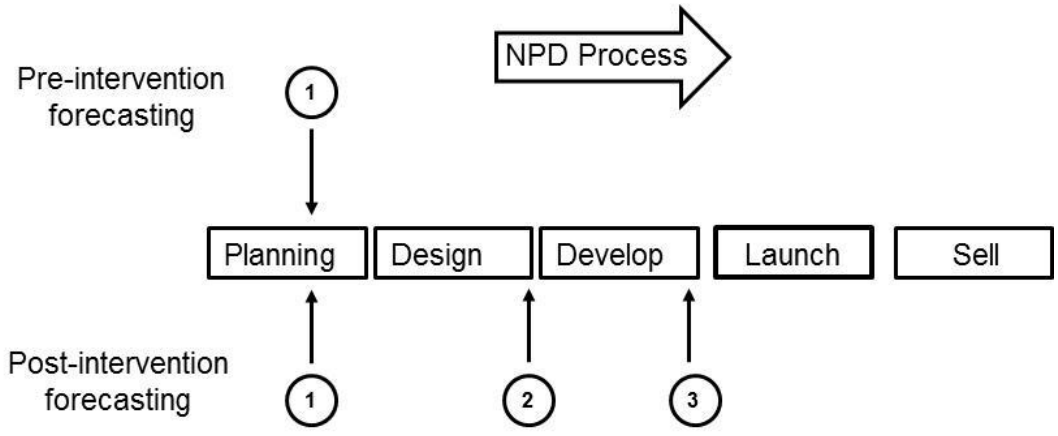
We then re-forecast at second prototype, so that we have the most up-to-date "kill" decision-making.

Fashion-Three: Supply Chain Manager

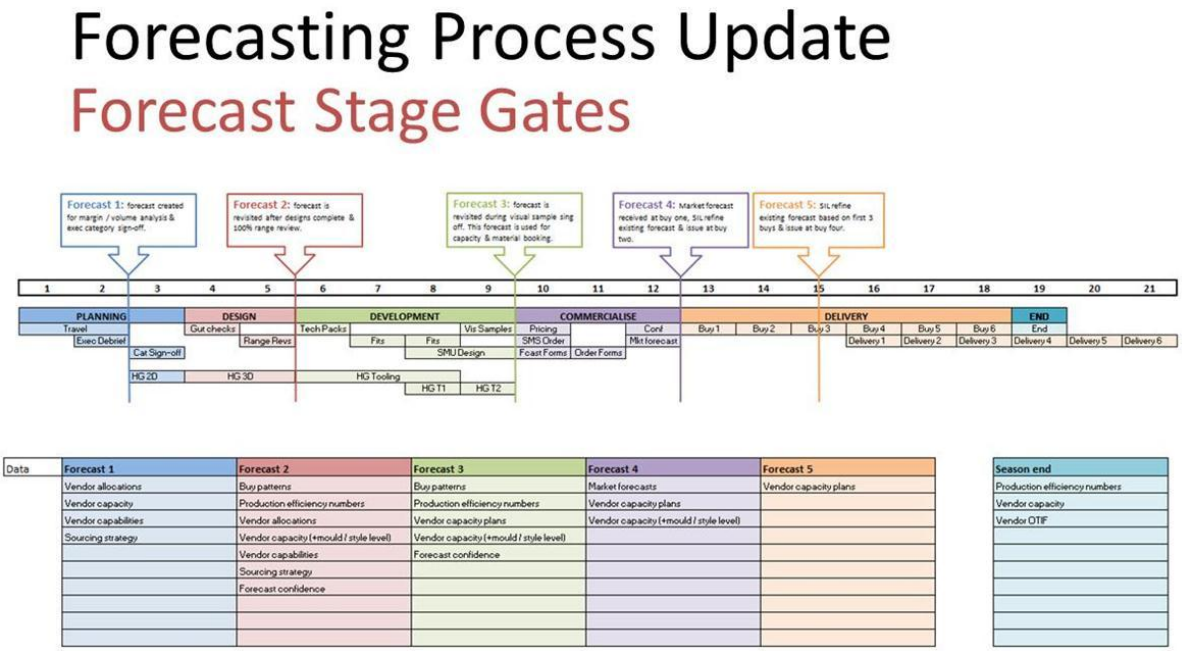
We are doing two bottom-up forecasts before launch. One a high level category forecast to start and a proper SCO level bottom-up forecast prior to launch. That's because our seasons are quite narrow. It's quite a narrow window.

Figure 55 Sport-One: More "Bottom-Up" Forecasting

a) Diagram showing the pre-intervention and post-intervention additional bottom-up forecasting



b) Sport-One internal schedule highlighting additional forecast stage-gates
(including two additional forecasts post launch, making a total of five forecasts)



Data	Forecast 1	Forecast 2	Forecast 3	Forecast 4	Forecast 5
	Vendor allocations	Buy patterns	Buy patterns	Market forecasts	Vendor capacity plans
	Vendor capacity	Production efficiency numbers	Production efficiency numbers	Vendor capacity plans	
	Vendor capabilities	Vendor allocations	Vendor capacity plans	Vendor capacity (+mould / style level)	
	Sourcing strategy	Vendor capacity (+mould / style level)	Vendor capacity (+mould / style level)		
		Vendor capabilities	Forecast confidence		
		Sourcing strategy			
		Forecast confidence			

Season end
Production efficiency numbers
Vendor capacity
Vendor OTIF

4.3.14 PRODUCT PORTFOLIO “MAPPING” AND “SCATTER-GRAPHS”

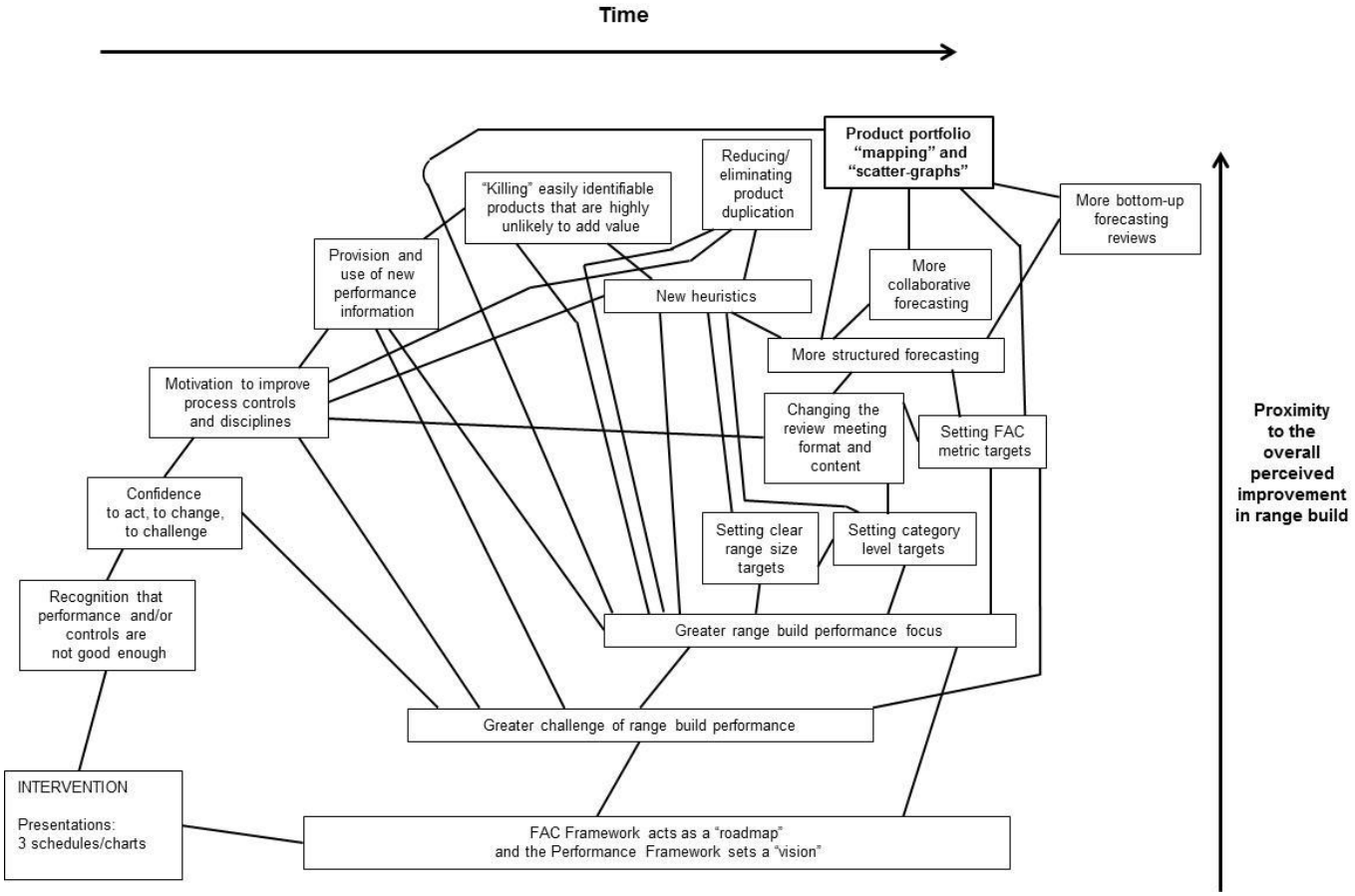
The combination of the greater portfolio performance focus, the forecasting developments and new target setting led management to construct a more sophisticated range forecast performance analysis, the “portfolio map” (Figure 56). Management call this ‘margin mapping’, ‘SCO performance quadrants’, ‘productivity matrix’ or a ‘forecast margin map’.

The structure of the ‘map’ typically has cash profit absolute value on the vertical axis and cash profit % on the horizontal axis. The products are either plotted as points on the chart, “scatter-graphs” (Figures 57 and 58) or segmented into boxes for decision-making purposes (Figure 57). In the Sport-One example (Figure 57), which over the intervention cycle was an analysis that was shared with some of the other cases, the four boxes were categorized as ‘Winners’, ‘Margin Rich’, ‘Volume Drivers’, and ‘Brand Strategic or Kill’.

Management describe how the analysis helps when discussing product justification, the ‘focus on “borderline” products’ that are at a box boundary line, its usefulness in

the stage-gate review meetings to ‘sense check’ decisions, helping ‘focus on the right areas’ and ‘understanding what’s driving value’.

Figure 56 Developmental Process Model – Step 14



In the data captured, considering the test of practical utility, management note the maps ‘have had a big impact’ and ‘are really valuable’. In the latter stages of the study, management describe overlaying the scatter-graphs onto the margin maps to help focus on products ‘that are in the top right hand corner of the “kill” box’ and assess what margin or volume improvements could make the product become a ‘winner’.

INTERVENTION

Sport-One Intervention

At the last range review, using the SCO performance quadrants, the Category managers now know they have to justify any SCOs in the bottom two low value sections. It forces the Category Manager to consider and get their story right.

The quadrant changes from last year to next year are charted and the hurdle rates and targets set by segment box, €30k value, 50% margin.

Product Managers are now having to justify if a product is below the threshold.

There are debates around the matrix but we're also looking more at the scatter-graph. Many products are closer to "margin rich", which need a different approach. So we're starting to look at the matrix and the scatter-graph together.

The scatter-graphs are really valuable, there is focus on "borderline" products.

How do we drive volume, especially the products in the top right hand corner of the bottom left hand box? Small changes in volume and margin can turn these "kill" products into "winners".

Walk-One Intervention

Using the Productivity Matrix spreadsheet makes you think about 'Where we need to grow new areas, where we need to retract?'.

INTERVIEWS

Sport-One: Supply Chain Manager

The forecast margin maps have had a big impact. Again, that tends to happen at the start of the process, which is great. Rather than doing a load of work and doing it half way through, we are doing it at the very start. At the review meetings we report it and the decisions have already been made. At the review meeting it's becoming more of a sense check than a decision.

Sport-One: Business Analyst

The quadrants margin mapping has helped our category teams focus on the right areas. It doesn't solve all your problems but it focuses attention in the right areas. Predominantly we are using the quadrant mapping at the planning stage, highlighting product in the bottom left that is forecast to do nothing on margin. We quickly and easily categorise a large number of products. It helps us understand which parts of the range are profitable. The volume is based on the Category forecast and the margin% based on the Product Development ex-factory prices.

Walk-One: Category Manager

Using the quadrants, with overlay of the scatter-graph. It's interesting, for example, the products that are in the top right hand corner of the "kill" box.

At the other level, we're working with the basic quadrant grid. It's taking a product and asking, how many units it's delivering, what's the margin. And if it's lower units and lower margin, it's not satisfying multiple regions or multiple retailers then let's get rid of it. So basically it's a line-by-line approach, it's an immediate look at it and go "keep or kill" on all this stuff. And then it's setting some clear parameters between what we're now trying to achieve with the new stuff that's going to replace it. Either it has a strategic or regional need with some long-term sustainability against it, or it's going to drive good units and it might be difficult margin, or it's going to drive good margin and it will grow the units. It's that quadrant approach to where all this product will sit.

Fashion-Three: Supply Chain Manager

We've also done margin mapping. We've tried to carve the range into segments, trying to understand what's driving the value. We've still more work to do on this. What I'm trying to get into people's heads, and they're getting it slowly, is that where they want to focus their negotiating efforts with vendors, in the volume drivers, in terms of ex-factory prices. The products that are average margin but drive a very high unit value. Let's focus most of our negotiating effort there, rather than on a load of stuff that doesn't deliver value.

Figure 57 Sport-One "Margin Mapping"

(Vertical axis: product cash margin; Horizontal axis: product % margin)

Figure 58 Sport-One "Scatter-Graph"

(Vertical axis: product cash margin; Horizontal axis: product % margin; a single plot point represents a product in the range)

SCO Type	Count	%	Std Margin		Margin %	
Winners	137	49.6%	50.4%	> 30,000	93.5%	> 60%
Marg. Drivers	2	0.7%		= 30,000		= 60%
Strat?	16	5.8%	49.6%	< 30,000	6.5%	< 60%
Marg. Rich	121	43.8%				
Total	276	100.0%				

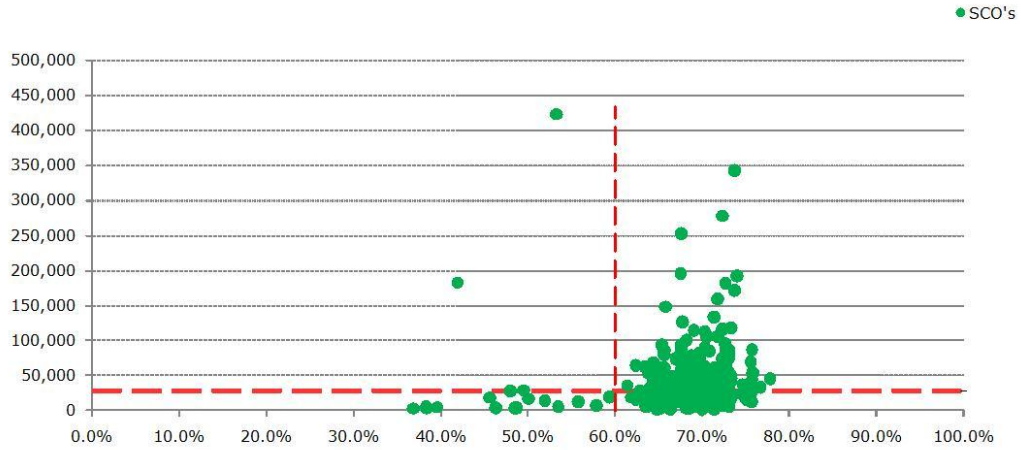
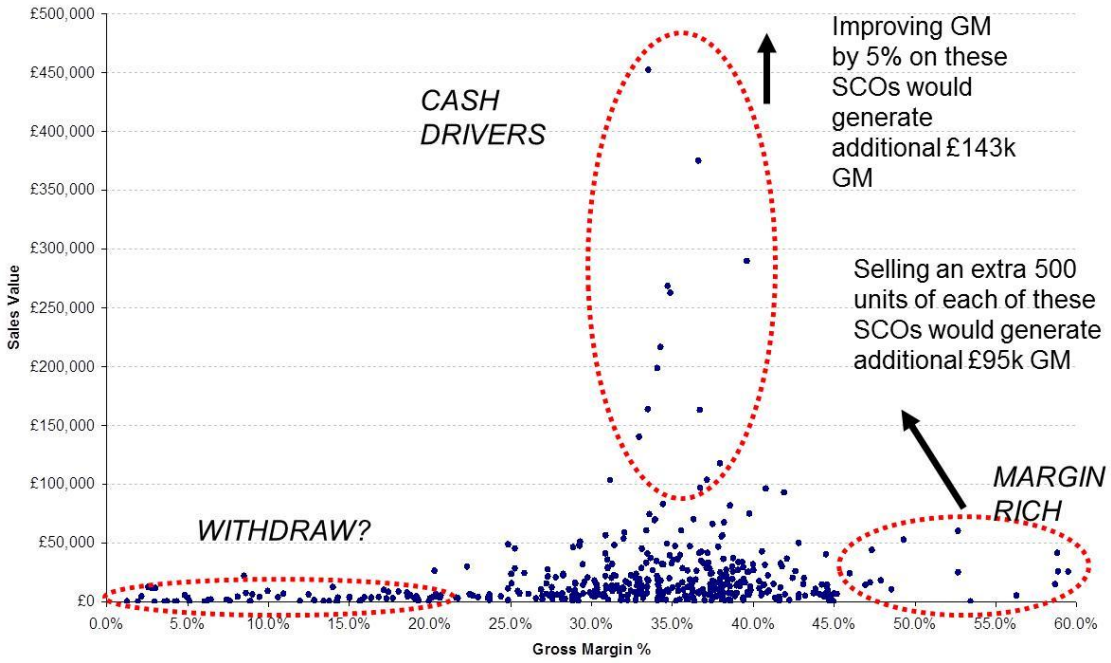


Figure 59 Fashion-Three "Scatter-Graph"

(Vertical axis: product revenue; Horizontal axis: product % margin; a single plot point represents a product in the range)

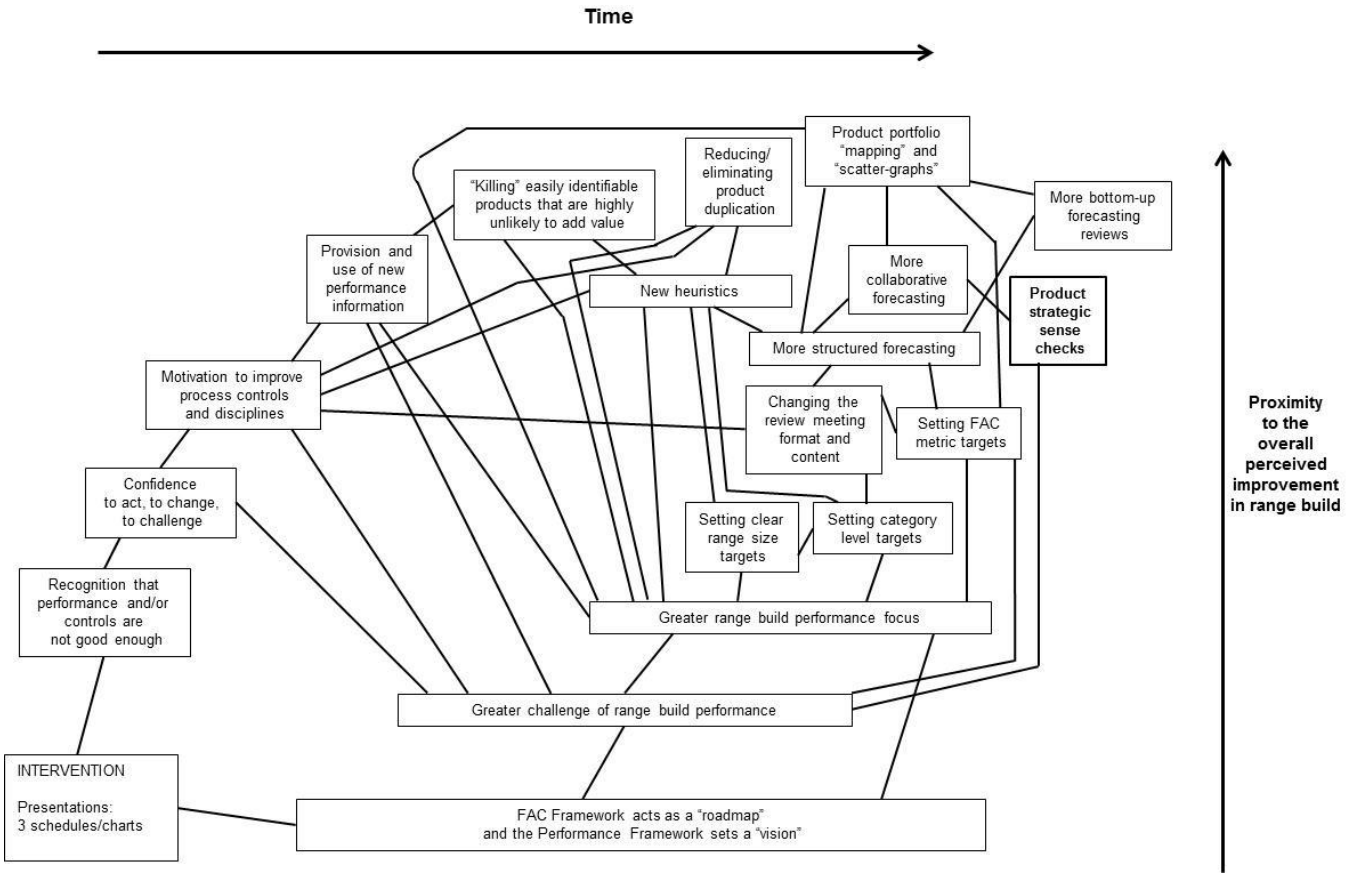


4.3.15 PRODUCT STRATEGIC SENSE CHECKS

In the FAC Framework, a key component of Level 3 is a “Strategic Fit Check” along with “Product level forecasting through the NPD process’. With the greater portfolio performance focus and more collaborative, cross-functional forecasting, more product strategic sense checks have been introduced into the process (Figure 60). The product “strategic fit check” helps the NPD teams achieve strategic alignment.

Management have introduced more ‘checks’ into the stage-gate review meetings. Management describe asking ‘Is this what we thought it was going to be?’, ‘Are we happy with the shape of the range? and ‘Is this product delivering against the category vision?’. These checks in the process are used to ‘build confidence in the forecast’, to have a ‘clear link to the strategic business plan’, ‘to sense check every decision…..that it all has the best chance of delivering that strategic plan number’.

Figure 60 Developmental Process Model – Step 15



INTERVENTION

Sport-One Intervention

At the first meeting, which has just happened, there is a range plan sign-off, with number of styles and SCOs. With the first volume forecast at SCO level they check that they are happy with the shape of the range.

INTERVIEWS

Sport-One: Supply Chain Manager

The points when you forecast and what you forecast on are critical. We do it once at the very start and we do it once before development. So that's another check we make just to say, "Are we sure?". Before we give products to the factories, when we're about to invest in development and tooling. And then we forecast again when the product has been developed and it's a check of "Is this what we thought it was going to be? Has it changed slightly. Does it affect the volume?" And that's just before we give forecasts to our vendors, when we book fabrics and capacity in the factories. And what we've found with that is that historically we'd have a lot of products fall out of the range after launch, when we'd had forecasts from the markets, probably between 5 and 10% could fall out of the range. Whereas now that happens a lot earlier. We're doing that before the market even sees our range of products. So we're more confident in the products that we show to our customers.

And we're also trying to build in confidence levels. So, depending on how the range is structured, checking how many "run-on" products there are, how much "newness", how much "seasonal" product. It all affects the confidence in your forecast. We're now trying to put some monetary values behind that and what it means for the range.

Sport-Two: Business Analyst

When we look at top performers we are asking, where does it fit within our carryovers and SMUs? We've categorised the range, looking at the performance across the categories and looking at the efficiency of it.

The next step is that when we have the range sign-off we have more information embedded in the process looking at carryovers and SMUs. And seeing better which areas of the business are driving margin. And where conversion is high or low.

Walk-One: Category Manager

There's now a clear link to the strategic business plan, the financials and the numbers. As soon as those change it's about making sure we're still delivering the numbers. We're making sure we have the latest numbers, the latest information. In the SBP we are now pushing up the clear category visions to support the product

vision. It's like category strategies, business strategies. We now have three to five year category strategies. This is quite big picture control before we get into the detail controls on consistent messages to the consumer. I think it enables you to go after macro trends in the market, rather than micro.

It gives more visibility across the business about what we're trying to achieve. You can then test the micro trends against the category visions. You can ask "Is this product delivering against the category vision?" If not then, "Why is it here?".

And I know the total number of new styles and how many are going to be outdoor jackets. I know whether it's going to work to get the growth we want. We're trying to sense-check every decision to make sure whatever way you look at it, whether by product type, category or gender that it all has the best chance of delivering that strategic plan number.

Fashion-Two: Product Manager

Carrying on making meals that people don't want to eat is not a good recipe for success. We're all being challenged in the current climate to be "lean and mean". There is a re-evaluation of where our best efforts are spent. Even though it's range planning for me it's now strategic business thinking. That goes with our whole approach.

Fashion-Three: Supply Chain Manager

At the same time we are now doing a reconciliation of the forecast against the business plan, which for a lot of people is still a big gap actually. It is hard to do. We can take a unit forecast for next year, we get a number back, we roll it up into a wholesale number and see that it's completely wrong. The forecast says we'll deliver €5m when it should be €7.5m. "that has got to be wrong, let's go back and check". We're still quite rudimentary in the way the forecasts are being done, it's a journey for us to try and improve our processes.

4.3.16 PROMOTING FAC METRIC "ENHANCERS", REDUCE "DIMINISHERS" AND HIGHER LEVELS OF FAC IN USE

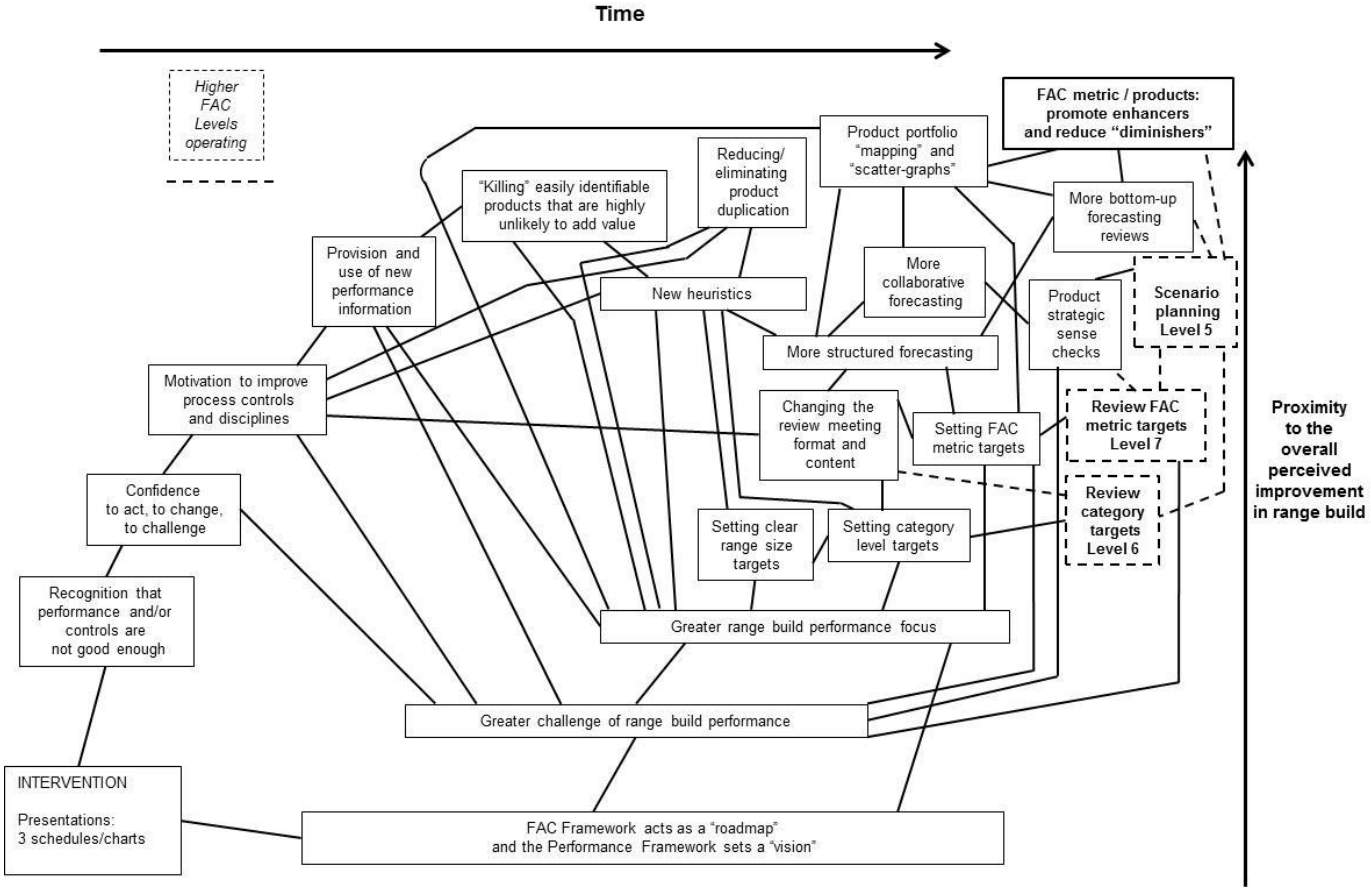
The application of more collaborative and bottom-up forecasting in the management of the NPD process, combined with the use of portfolio mapping analysis and scatter-graphs and the new heuristics result in the "promotion" into the range of products that enhance overall cash margin and the cash margin per product (FAC Metric). The combination of these changes also guides management, through the

stage-gate process, into eliminating products that “diminish” the FAC Metric performance (Figure 61).

Management of Sport-One, the case which achieved the highest post intervention FAC level, Level 7, describe ‘designing smarter’, with targets in place from ‘the start’, with a focus on cash ‘margin thresholds’ and using the ‘map quadrants’ to eliminate products that are forecast to be in the ‘bottom left’ “kill” box.

Finally, the higher levels of FAC, with double-loop learning (Argyris, 1976, 1977; Senge and Fulmer, 1993) were only exhibited by Sport-One and Sport-Two. Sport-One is the only case, post intervention, by the end of the study, where NPD management review the FAC Metric target. The management of Sport-One review the cash margin thresholds, by product category, when setting targets for the “margin mapping” analysis, which is an analysis now used in the stage-gate review meetings.

Figure 61 Developmental Process Model – Step 16



Scenario planning, FAC level 5, is used by Sport-One and Sport-Two. Management describe how scenario planning 'focuses the mind on what has to work harder to drive the cash', it helps 'prompt questions' and gives more 'confidence in what the range is expected to do'. Sport-Two has developed, with my intervention support, a "Forecast Uncertainty" chart (Figure 62). The vertical axis of the chart is the forecast volume by product and the horizontal axis is the level of uncertainty in that product forecast volume. Category management calculate uncertainty range by the spread of the forecast volume range for each particular product. The chart highlights in the "top right box" potentially important volume products where there is high forecast uncertainty. In Sport-Two these products have become a focus for management attention with the aim of taking action to reduce the uncertainty. As the Sport-Two Business Analyst notes, '*The whole point is to get them* (the NPD management team in the stage-gate review meeting) *to think about the range anyway*'.

INTERVENTION

SCENARIO PLANNING

Sport-One Intervention

Scenario planning focuses the mind on what has to work harder to drive the cash I want. It focuses where you want to add products, where to add newness and where not, and the effect on margin.

INTERVIEWS

SCENARIO PLANNING

Sport-Two: Business Analyst

When we had looked at the history in this way, we started to say how can we apply this going forwards? How can we apply this in building ranges for the future? There were several different aspects, the main one was at the time the line plans were being built. It was sitting down and saying "This is what my line plan looks like, let's start analysing it properly". One of the big things was using the quadrants, that looked at winners, losers, high certainty and low certainty. We turned round to the team and said "This is what you think it will do but how sure are you that it will be at that level?" We were challenging the forecast certainty. And really helping you stand back and identify, pictorially, and check whether you're planning to do loads of shoes

which will have low volumes. Why are those low volume styles there? Is there a strategic reason? It's just to prompt questions. My role is to prompt those questions.

The forecast uncertainty chart, that's more for the Product Director. It helps him prompt questions and sometimes it cements things he already knows within the range. In the last review the majority was reinforcing, giving him comfort and confidence in what he was expecting the range to do. The whole point is to get them to think about the range anyway.

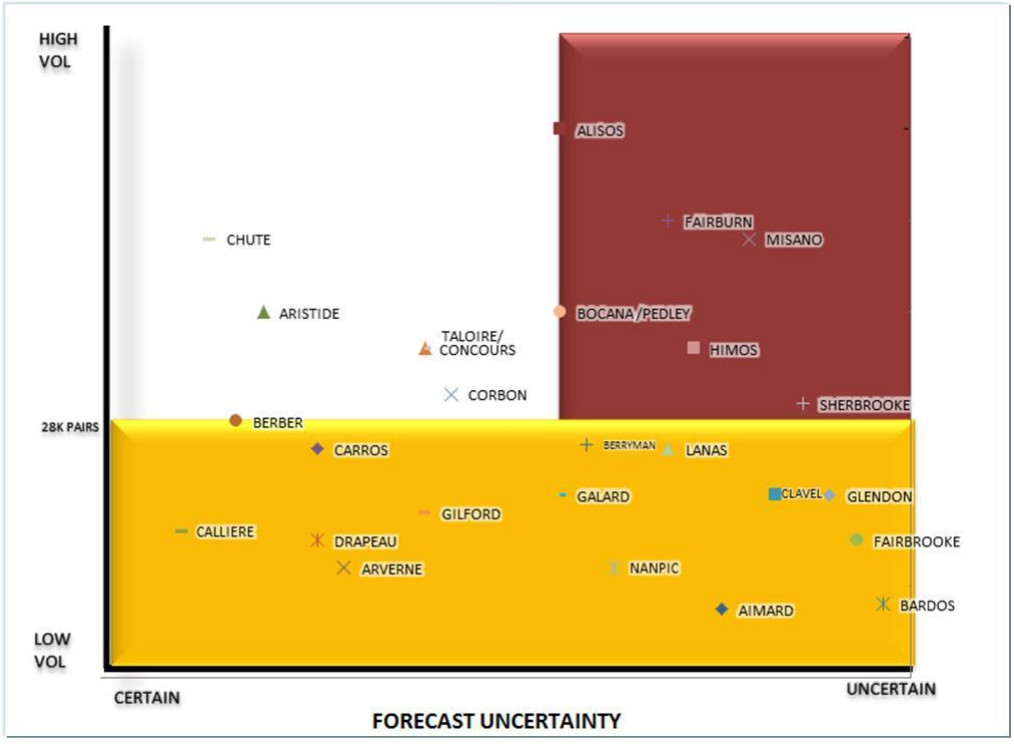
PROMOTING FAC METRIC "ENHANCERS" AND REDUCING "DIMINISHERS"

Sport-One: COO

We now have a Category Management head who takes a helicopter view and sets parameters. Let's say "designing smarter", we've got parameters in place before you even start designing, limitations on range size, the percentage of newness that the designers can bring in. We've been a lot harder on margin thresholds, based on forecasts, and with the quadrants where if it's down in the bottom left, you don't even talk about it because it's not even a conversation that's worth having. Unless it's for strategic reasons.

Figure 62 Sport-Two "Forecast Uncertainty" Chart

Vertical axis is forecast volume; horizontal axis is a "calculated" level of forecast uncertainty by product



4.3.17 DEVELOPMENTAL PROCESS MODEL – FINAL RESULT

'The progressions of activities and events' the focal unit undergoes 'as it changes over time' (Van de Ven, 2007) is presented in Figure 63.

The management perception of the improvement in portfolio value is reached by the changes in the "killing" of easily identifiable products that are highly unlikely to add value, the reduction in product duplication, the use of "portfolio margin mapping" analysis in product review meetings and the more structured, collaborative, "bottom-up" forecasting that promotes FAC Metric "enhancers" in the range and reduces the number of FAC Metric "diminishers".

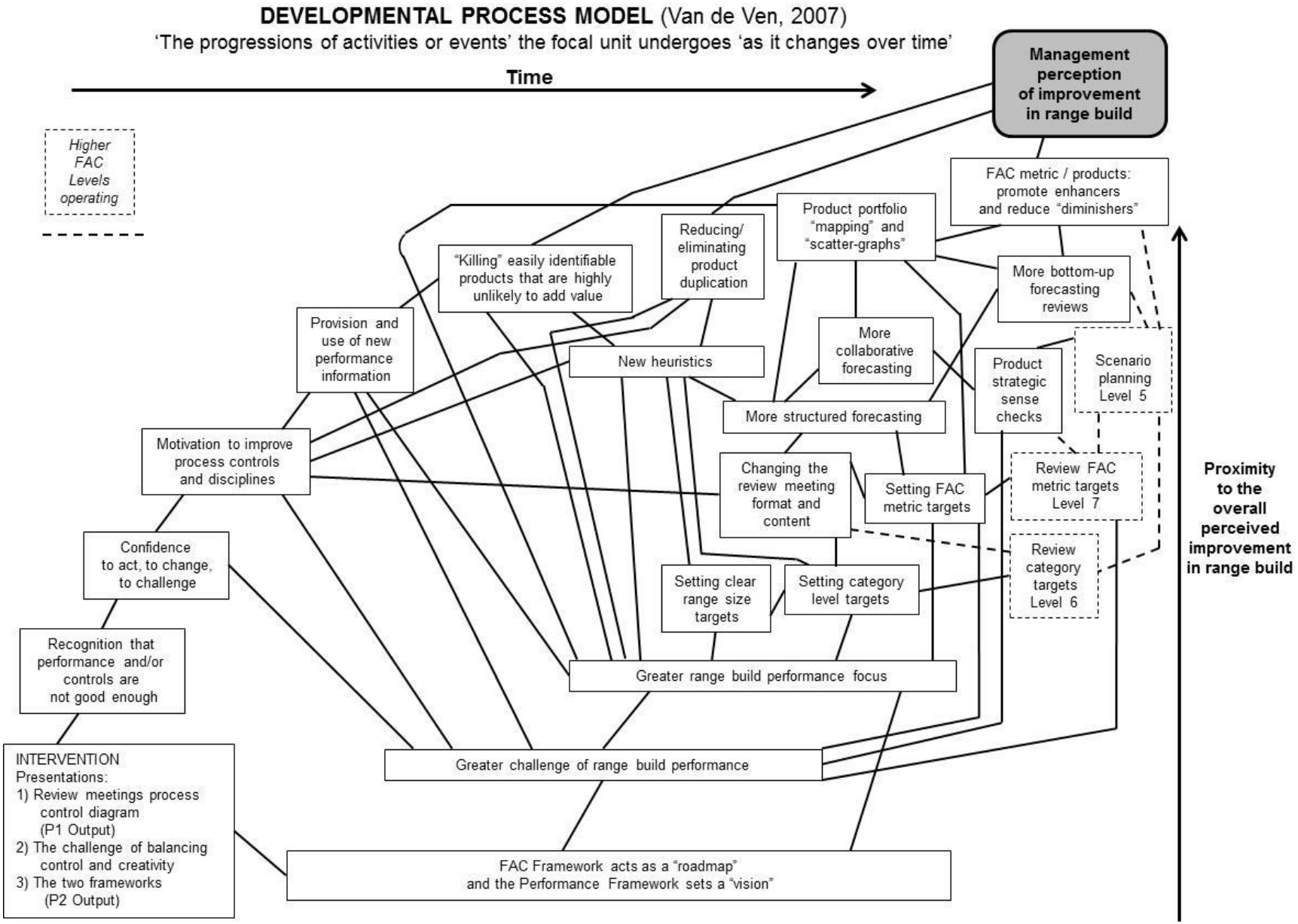
The more collaborative cross-functional challenge, focus and forecasting appears to increase the NPD management teams perception of improvement in strategic alignment. This is also evidenced by changes in stage-gate review meeting participation, format and content.

The developmental process model (Van de Ven, 2007) in Figure 63 identifies the mechanisms of the changes in control adopted by the NPD teams over time, when moving to higher levels of FAC sophistication. The identification of these mechanisms increases the validity of my research and explains why there is a tendency to generate higher portfolio values and greater strategic alignment when NPD teams apply higher levels of FAC sophistication.

The model provides evidence that management was able to use the FAC Framework (feasibility) and that they did use the Framework (usability). Also, when management use the Framework they find it useful and valuable (utility) in the management of stage-gate NPD.

The model provides methodological triangulation in the study for assessing the propositions and the performance of the FAC Framework against the three practical benefit tests of feasibility, usability and utility.

Figure 63 Developmental Process Model – Final Result



The developmental process model was sense-checked with six of the intervention participants who were also semi-structured interview informants, for validity and reliability purposes. The six informants represent five separate intervention cases. They were asked; “How does this model and the build of each stage relate to your understanding of how the change happened?”

The data, presented in the table below, appears to show that the developmental process model has captured the key events of how these managers perceive the change to have happened. They describe ‘That tells the journey we’ve been on’, ‘I can totally associate to that’s what we went through’, ‘It absolutely shows the bulk of what we went through’ and ‘As you’re showing, there are a huge amount of steps’.

Sport-One: Supply Chain Manager

Yes, it feels very much like the journey we went on. An important part for us now is on scenario planning. It could be really important for us.

It definitely helps building it up to show it. I think it’s a really good way of presenting it.

Sport-Two: Product Category Director

That’s definitely what I went through. The framework came in at just the right time for me. I was looking for something to help, I didn’t know which way to go next. If I didn’t have it I would have gone through a different route and would I have got the same results? I also think the framework gave me motivation because of where we were compared to the other brands. I thought “I need to get to Level 7 or I’ll get left behind”. So the framework is a motivator.

Sport-Two: Business Analyst

That tells the journey we’ve been on. It did give me confidence, a framework and measurements and a real focus. Before our first chat it felt like fumbling in the dark. A lot of these words resonate exactly with the journey we went on. It makes me realise how far we’ve come. There are some real and helpful words in there, especially on forecasting, that’s added huge value to the business. It really strikes a chord.

Foot-One: Managing Director

It absolutely shows the bulk of what we went through. Only the more sophisticated bit at the top end we're not doing. Having the confidence to make the choice and trust in the info much more. It's the understanding of what does and doesn't work and what adds value in those collections. It is no longer gut feel, it's become an educated considered choice. There have been the cultural and behavioural changes in the team. They understand better what adds value and that's across the whole team.

Walk-One: Supply Chain Manager

I can totally associate to that's what we went through, I like the way it builds up to show what happened.

Fashion-Three: Supply Chain Manager

The proof is in the pudding, the reduction in range size has had such a big impact on performance. It is the number one factor that has taken the business from where it was to where it is now. It has taken time for people to let go and accept it and a couple of seasons to see it. As you're showing, there are a huge amount of steps but in principle it is simple.

I presented earlier in the results the soft measures findings where the NPD teams observe a significant improvement in portfolio performance. The next results section reports on my additional investigation to assess how management perceive that the change in control has improved portfolio value. This data is valuable in providing further evidence that supports validity of the first proposition.

4.4 FAC and Portfolio Value Relationship

To augment the evidence to assess the first proposition and also the practical utility of the FAC Framework, the semi-structured interview informants were asked about their perceptions of any relationship between changing the level of FAC and changes in portfolio performance.

The results section on the significant “other” management perceived drivers of portfolio performance (Table 18), other than the change in FAC levels, highlights the limitations of the research design to show any cause and effect between control and performance. However, evidence directly captured from the intervention participants and their perception on any relationship is helpful in supporting assessment of the first proposition and the practical benefits tests on the FAC Framework.

Presented below, in the data table, is evidence that management perceive that there is a direct relationship between changing the levels of FAC and the improvement in performance. Informants describe how ‘it goes hand-in-hand’, that ‘the two are connected’, ‘they’re definitely related’, ‘absolutely it’s helped performance’, ‘of course there’s a relationship’ and ‘the seven steps to heaven’.

Informants note how the intervention, metrics and ‘quadrant mapping’ has helped change performance. The movement through the FAC levels, ‘going up the ladder’, is noted for ‘how it could be used to raise performance’.

This data provides further evidence validating the first proposition and the practical utility of the FAC Framework.

FAC AND PORTFOLIO VALUE RELATIONSHIP

Sport-One: COO

If I look at the metrics, you’d say we’ve done a phenomenal job. SCO productivity has increased by 24%, the range size has reduced significantly, by 30%. We’ve thought a lot more about style and colour continuity and the percentage of newness we’ve brought into the range has significantly declined. We now have core essentials that’ll probably run on for four seasons.

A lot of the change was driven by your intervention and the conversations you had with us. I think that education and then people understanding the range planning process in a bit more detail has allowed us to make those strides to where we are today.

Yes, I definitely see that. When I think about the leaders involved in range planning they are challenging the status quo a lot more. And that’s been a

distinct change.

Sport-One: Business Analyst

The use of the quadrant mapping has helped change performance. We always assumed that the Category Managers were quite precious about their ranges but when you actually get to the bottom of it they're not. They don't want to make product that doesn't do well, that doesn't sell, that we get left with a lot of excess stock. The fact that they now understand that and have bought into it, it's made a massive difference.

Sport-Two: Product Category Director

The seven steps to heaven.

Definitely. Because the levels of awareness of the metrics, so what does success look like, will improve at each higher FAC level that you go up here. Which means that you can then communicate it, if you're the right kind of person, you communicate it across the whole business to improve all of the things that are on the Performance Framework. I think it's awareness about that is what a Product Manager does.

Sport-Two: Business Analyst

I think it goes hand-in-hand. For me, at every point, as we move through the levels you can see how it could be used to raise performance.

Walk-One: Category Manager

I think it's important. The two are connected.

Walk-One: Supply Chain Manager

They're definitely related. In the past none of that existed, so it was all just allowed to flush through. And then we would complain about it. And there would be no real challenge other than "You're doing too much".

Foot-One: Category Manager

Absolutely it's helped performance. I think this principle of these levels, it's familiarity and it's experience. So you deal with the first step and then you naturally evolve and want to intelligently think differently. And you go up the ladder again. I think it's also about going back and questioning and re-assessing, constantly evolving the approach. You become more qualified and

knowledgeable and therefore you start asking more questions that you wouldn't have done to begin with.

Foot-One: Head of Supply Chain

Definitely, without a doubt. A lot of it is because the fact that we're able to have a better relationship with our vendors. Because of the internal way we work we're able to be a much better customer to your vendors. And if you're able to be a better customer he's able to deliver a better service. Which means your margin doesn't get eroded. And you deliver on time. Which means next season your customers order more from you. They've got confidence in you. That's really a big factor.

Fashion-Three: Managing Director

Of course there's the relationship. I think that's the journey we're on. On the controls we are now looking at the key meetings and what is the input into those meetings. The Head of Design is now saying to me "If I'm going to develop the right range for you for our strategic planning and international opportunities I need more information and to understand it". We now need to think about how we put that into a format or framework that adds value to the team.

The next section presents the data captured on managements' perception of the importance of consolidating the lower levels of FAC sophistication to achieve higher levels of the FAC Framework.

4.5 FAC Framework – Consolidation of Levels

A finding noted in my first empirical study (Project 2), that required testing in this study, is that achievement of higher FAC levels is contingent on consolidation of the lower levels. The methodology used in this action research study and with the semi-structured interviews has captured data on the management perception of this contingent consolidation of lower FAC levels to achieve higher FAC levels.

The data suggests that management perceive that to achieve higher levels of FAC sophistication does require consolidation of the lower FAC levels. Management describe that achieving consolidation of the lower levels is like having 'solid foundations', and the need to 'learn at each level', with the

previous set of skills enabling 'moving on to the next one', moving through 'the stages in a natural progressive way' and 'some of the stuff underneath under-pinning it'.

The Foot-One Category Manager observed: '*I think there is a reason why the ladder is split out this way because I think it's like small steps to be really professional in category management, forecasting and range building. These fundamental building blocks need to be put into place*.'

Sport-Two Product Category Director makes a similar point: '*which is what would happen if you went from Level zero to Level 7, you would find that some of these things would get missed and you wouldn't understand why you were successful in the first place. Because you can't control what you've changed. You need to learn at each level of the process'.*

This evidence finds that management perceive that the achievement of higher levels of FAC sophistication is contingent on consolidation of the lower levels of FAC.

This result, that management are able to consider, understand and agree with this consolidation concept, provides further evidence that management find that the FAC Framework has practical utility in managing NPD portfolio performance. The NPD management team perception of a relationship between changing levels of control and changing performance also provides further evidence in support of the first proposition.

CONSOLIDATION OF LEVELS

Sport-One: COO
It's like building a house. You need solid foundations.

Sport-One: Supply Chain Manager
It's important to keep them separated and checking. You need to be doing each of them to be effective at the top.

Sport-Two: Product Category Director

Without a doubt. Definitely. If you try to introduce forecasting and you've never done it before it's incredibly difficult. And then if you're not used to forecasting through the entire process then you don't truly understand what you've changed. Which means you can't truly understand where you fit strategically with what's going on. And when you are skimming across the top, which is what would happen if you went from Level zero to Level 7, you would find that some of these things would get missed and you wouldn't understand why you were successful in the first place. Because you can't control what you've changed. You need to learn at each level of the process "this worked for me and this didn't" and therefore "I'm going to get rid of this and focus on this".

Foot-One: Managing Director

If you try and do something a level above, this is a flowchart, and you can't do some of that without having the previous set of skills because they enable moving on to the next one.

Foot-One: Category Manager

I think it's important to do each of the stages in a natural progressive way. Because to leap up to a higher level I don't think we would be able, from being qualified or intellectually capable yet to make the right decisions. I think there is a reason why the ladder is split out this way because I think it's like small steps to be really professional in category management, forecasting and range building. These fundamental building blocks need to be put into place.

Fashion-Three: Managing Director

Now we're playing at level 6 and 7 without having some of the other stuff underneath it, under-pinning it. So that's what this next project is about. I can have a report that is at Level 6 and 7, we have the capability to do that. What then we don't have is Levels, 3, 4 and 5. You need all of these you see. The risk is having one without the other.

The next results section discusses the data, directly obtained from semi-structured interview, on the tests of feasibility, usability and utility. The section also discusses challenges of using the FAC Framework, raised by the informants.

4.6 Feasibility, Usability and Utility

I am using the practical benefits tests to assess whether the FAC Framework has feasibility, usability and utility (Platts, 1993) and to provide reliability and triangulation on the contribution to knowledge of practice.

Given the importance of the claim of practical utility to the contribution to knowledge of practice, it made methodological sense to directly ask the intervention participants in the post-intervention semi-structured interviews for their views. The data captured, presented in the table below, can be used to provide evidence to support the claim of the practical benefits of the FAC Framework.

This section also discusses data, captured in the interviews, where management have raised challenges about using the FAC Framework.

On “feasibility” management describe ‘it’s very plain and simple’, ‘easy to look at and quite straight forward’, ‘a very structured, logical framework’, ‘he saw the logic in it straight away….where we were and where we needed to get to’, ‘it made sense’ and ‘the ladder is always in my head now because I understand it’.

On “usability” management describe it as a ‘tool that allows you to have the right conversations’, ‘the most important thing for me was that from this framework someone else was thinking about levels, 4, 5, 6 and7’, ‘the Category Manager …. refers back to it quite a bit’, ‘it’s important to know where you are’, ‘it’s about building it and taking one step at a time’ and ‘I could see that there was so much more that we could do. I wanted to learn it and how to use it.’

On “utility” management describe the financial and performance benefits of better management of range size, about the benefit of having ‘these core disciplines in place’ and ‘it was put in a way that I could understand the benefits of it’.

In addition to the other results presented, asking intervention participants, post-intervention, on the direct question of practical benefits has provided more evidence that the FAC Framework has feasibility, usability and utility.

FAC FRAMEWORK: FEASIBILITY, USABILITY AND UTILITY

Sport-One: COO

I get it, so yes. It's useful to relate it back to people in terms of "this is what we expect of you in your role. To get to this, this is what it needs to look like". This is a tool that allows you to have the right conversations.

Financially I think it's the reduction in the range because we've got a more condensed range we're not buying too wide. I think the margin threshold has been the biggest one. We've increased our gross margin by 1.5% in the past year. That's worth a $1m. The conversation with the factories and the distribution partners is a lot better. We've got a smaller range, longer production runs, better efficiency, better conversations. That change in the range size has allowed us to run the production lines for longer. And we've got more continuity in the styles. That's also helped from an inventory point of view with our distribution partners. Our overall stock levels have dropped by a third.

Sport-One: Business Analyst

Yes. You couldn't make it any easier. It's very plain and simple. But that's how my mind works. It's visual, easy to look at and quite straight forward.

Sport-Two: Product Category Director

Yes, definitely. I think the most important thing for me is to go past the level where you are. When I first joined the business I was probably already at Level 3. My biggest challenge for myself was that I could implement all these things into the rest of the business, which I did quite a good job of doing. But then where do I go from there? The most important thing for me was that from this framework someone else was thinking about levels 4, 5, 6 and 7. If it wasn't put forward to me that you actually can start to scenario plan, I might have got there but it might have taken me ten years. Whereas it's taken me less than a year. I think that made the difference for me, more than anything else.

Walk-One: Category Manager

The biggest challenge in applying this level of thinking is trying to get people to understand where you're wanting to go and taking them on the journey. Not everyone thinks in the same way and you've got to work that out because this is a very structured, logical, framework.

Walk-One: Supply Chain Manager

The Category Manager and I were talking about it not long ago. He refers back to it quite a bit. In conversation he'll refer back to it. I think he saw the logic in it straight away. He could see where we were and where we needed to get to.

Yes, it's important to know where you are. I've said in the past that when all the goings great and you're churning out cash, some of these things don't get the right level of focus. That's a shame because you should have these core disciplines in place, no matter what. It should be driven from the top, which at the moment it isn't.

Foot-One: Managing Director

It made sense. When it's put to you in such a way that it's about "levels", it's not about going from zero to perfection, it's about building it and taking one step at a time. It was put in a way that I could understand the benefits of it, at an appropriate level, so that it didn't overwhelm you, that's when you can't get it.

Foot-One: Head of Supply Chain

Yes, absolutely range build performance has changed. We've got a lot more cash value coming out of each SCO. And order size to vendors has increased.

Foot-One: Category Manager

That ladder is always in my head now because I understand it. When you showed it to me I was really excited because when I started we didn't even have any analytical review, just literally "gut –feel" from the designers. And now I could see that there was so much more that we could do. I wanted to learn it and how to use it.

Yes. I'm a visual learner. So I see tables and can understand the information. And if you have a start and a finish most people can follow that. And by giving yourself levels, if you know you have to work towards something, you're going to do it. If you want to get to the next level and you need to do "that", you're going to do it.

In the interviews, management have also raised challenges about using the FAC Framework. The data is presented in Appendix BB.

The Sport-One COO notes how the language on the Framework needs to be simpler for Designers to be able to understand it. The Sport-Two Product Category Director notes a number of challenges. Firstly, if Sales people cannot 'handle objections with the retailer' it can affect the FAC metric target. Secondly, that in the movement from one FAC level to the next, the challenges to improve are very different. Thirdly, that NPD portfolio performance is not important to some of the people in the business; '*it's getting people to understand the importance of doing these things. I think that's a challenge across the entire business. If you start speaking to certain people about SCO productivity, they just switch off because it's not important to them.'* Finally he notes that some people struggle '*in terms of dealing with the unpredictable nature of the things that we do*'.

Another comment, related to the utility of the Framework, from the Sport-Two Product Category Director is that '*Ultimately what people need to understand is that things like these frameworks help create the conditions for success. They don't necessarily create the success itself.'*

The Foot-One Head of Supply Chain, who was not an intervention participant, raised the issue of whether the Category level of product categorization is always the appropriate level.

These results capture observed challenges and concerns when using the FAC Framework. The observations appear to raise issues on feasibility and usability, in the use of the language and in getting an understanding 'across the entire business'.

These challenges need to be considered when assessing the overall feasibility, usability and utility of the FAC Framework.

The next section presents the results from the semi-structured interviews with the Group COO and Group CFO, which provides additional triangulation.

4.7 Additional Semi-structured Interviews for Triangulation Purposes: Group CFO and COO

The Group Chief Operating Officer (COO) and Group Chief Financial Officer (CFO) provide a valuable cross-case perspective and triangulation opportunity for observed changes in controls and portfolio performance.

The data tables below firstly capture their perspectives on the changes in NPD controls over the period of study, their observations of changes in portfolio performance and observed changes in strategic alignment. Their comments on the relationship between control and performance are noted and also the assessment of the FAC Framework against the practical benefits tests.

Firstly, with the NPD controls, changes are observed in the increased use of metrics, notably product productivity, and a 'far more formalized approach' and greater disciplines applied in the management of the NPD process.

OBSERVED CHANGES IN NPD CONTROLS

Group COO:

Yes, right across the board there is a far greater awareness of decisions around ranges having consequences, in driving ultimate results. Every brand is on the journey and that's acknowledged everywhere. I think everyone was at a different starting point and I think everyone has got a different pace.

As a result people talk far more about numbers in this organisation than they ever used to. Measures are in place. People are monitoring this stuff. And the reality was, if it was done five years ago, it was more lip service. Nobody thought it was really important. People thought you could make more money by asking a factory to have lower FOBs. And nobody thinks that now.

With our recent new brand acquisition their drop-out rate was high forties percent. None of our businesses would be tolerating that level now. You can see the transition we've gone through.

It's drop-out rates, it's productivity per SCO. And it's the fact that people are talking about that. I almost don't care what the numbers are. It's the fact that

people are talking about it and are focused on it. That it's something they want to improve. That's far more important. It's the fact that people are talking about investing in the relationship with factories.

I am aware of a far more formalized stage-gate approach. I am aware of people being realistic about the fact that there are hurdles to jump through to ensure things in a range.

Group CFO:

There is a mindfulness now about "Will we get the volumes?", before we start. "If it's not going to hit that we're not going to do it?". I think that feeds back into the development process, if it's not likely to get there why would you start. I think it's starting to embed.

I'm seeing Finance involved in debriefs on range performance as an input into the new range. There is much more focus on having discipline throughout the process and stage-gates. And a better managed critical path overall.

Secondly, with portfolio performance, improvements are observed in 'sales, margin, overhead, cash' and improvements in product productivity, the FAC metric. The Group CFO observes that the intervention cases are achieving a 'margin dividend'.

OBSERVED CHANGES IN PORTFOLIO PERFORMANCE

Group COO:

And where do we see a benefit, it's sales, margin, overhead, cash…It's striking and it's still not good enough so there's still more to go at.

Group CFO:

Absolutely I can see that sales are either not declining or they're growing and yet the majority of brands are seeking to tighten up their ranges. So the impact is evident there. And that obviously manifests itself in sales per SCO. And likewise we are seeing benefits if you go to Foot-One and Fashion-Three, which is very much a COO driven thing, but by looking at the end-to-end process and making your range fit for purpose, and that's from a consumer and a supplier perspective, they've had the margin dividend.

With observations of changes in strategic alignment the informants describe a greater team approach, with more cross-functional involvement that is more 'joined-up' on portfolio performance.

OBSERVED CHANGES IN STRATEGIC ALIGNMENT

Group COO:

I think almost everywhere the actual range build is led by people who understand that they are just one part of an end-to-end process. And I think that's a massive difference. And so five years ago, culturally, building the range was the end into itself and then if you had problems it was because "the supply chain screwed up". And that was regardless of whether you were adding stuff late or not getting the factory capacity lined up. Whatever mistakes we had made, it was "supply chain's fault". I think now in pretty much every single business people who are putting together the range understand that they are part of a team that isn't successful until the range is in the market.

Group CFO:

Certainly from the meetings disciplines side. It is increasing, and it's much more anecdotal in my case, but I'm seeing much more around up-front thinking that's going into when we kick the range off. What we're trying to achieve with it. And they're becoming much more joined up across the business in the sense that Finance is involved in that first meeting. Sales are in the meeting. Supply Chain is in the meeting and Design and Development. And Marketing is in the meeting and that was something that wasn't joined up before. So there's a much more joined-up with "What are we trying to achieve with the range?".

With changes in controls the Group COO has observed improvements in capacity planning and capacity management with third party vendors. The Group CFO notes that it 'has become accepted wisdom' of the benefits of a 'tighter' product range and more 'discipline'.

CONTROL AND PERFORMANCE

Group COO:

Yes, as part of the overall flow through. Because what that then drives, if you do

it right, is the capacity planning and capacity conversations with factories.

Group CFO:

Yes. It has become accepted wisdom that a big range doesn't constitute big sales. I'd say more than that, it has become accepted wisdom that having a tighter range is better. That was language not commonly being used before.

We've definitely seen some improvements. There's an acceptance that we have to be more disciplined and professional.

The Group CFO has not observed the FAC Framework in use. The Group COO observes that the framework has variable use across the subsidiaries and that 'Most businesses are looking at most levels of this now, in one way or another' and that product productivity targets are being discussed in planning meetings.

FAC FRAMEWORK FEASIBILITY, USABILITY AND UTILITY

Group COO:

Yes. In differing levels and in different places in the organisation, from relatively formalized to ad hoc. Most businesses are looking at most levels of this now, in one way or the other. So I've had conversations, for example, with the people in Sport-Two how their categories are shaping up to these targets. But it's not been a Board Meeting conversation with them. Whereas the COO of Sport-One would raise it to talk about what's an appropriate productivity level for a SCO.

The Group CFO raised the greater role of COOs in the subsidiary businesses as a driver of significant improvement. This is another significant driver of change not related to changes in FAC levels.

OTHER DRIVERS OF CHANGE

Group CFO:

I guess another thing that's making a difference is the rise and prevalence of COOs [Chief Operating Officer] *in the business. Because they are concerned with how effectively we work with the factories and having better processes. And they are having an impact back down the pipe without a shadow of a doubt.*

The observations from these two senior informants on changes in NPD controls, changes in portfolio performance, changes in strategic alignment, the relationship between control and performance and the practical use and value of the FAC Framework further augments the evidence supporting the propositions, the practical utility of the FAC Framework and the management perception of a relationship between changing FAC levels and improving portfolio performance. The observations captured also provide data triangulation and therefore enhance validity and reliability of the findings.

The results have been presented in seven sections: firstly the hard metric results and secondly the soft performance measure results, including other management perceived drivers of significant portfolio performance improvement not related to changes in FAC levels. Thirdly the developmental process model shows how the change happened, including changes in strategic alignment. Fourthly the management perceptions on the relationship between FAC and portfolio performance have been presented, fifthly the management views on achievement of higher FAC levels being contingent on consolidation of lower FAC levels, sixthly the NPD team views on the feasibility, usability and utility of the FAC Framework, and finally the additional semi-structured interviews with the Group CFO and the Group COO.

The next section discusses cross-case comparison, specifically addressing the moderators not controlled for in the research design.

5 CROSS-CASE COMPARISON

The methodology section notes the three moderators, identified in the systematic literature review, that were not controlled for in the research design; top management control, domain relevant knowledge and escalation of commitment. These moderators are considered in cross-case comparison for moderating effects on FAC and on the project results obtained.

Firstly, domain relevant knowledge is discussed.

5.1 Domain Relevant Knowledge

Domain relevant knowledge was discussed in detail in the methodology section where focal unit management industry experience was presented, as an indicator of domain relevant knowledge. The results indicate, in cross-case comparison, as discussed in the methodology section, no observed direct relationship between domain relevant knowledge, the final achieved FAC level, FAC metric performance and range cash profit change.

All the case teams had many years of industry experience, ranging on average from 5.5 years to 20 years. It has not been possible to control for any moderating effect. However, the hard metrics results (Table 15) and case management experience would indicate that there is not a cross-case effect in this study. Further research would be required to better understand any moderating effect on FAC.

5.2 Top Management Control

Top managers (MDs and Directors) participated in all six intervention cases. An attempt to control for the moderator was made, as discussed in the methodology, by presenting the systematic literature review findings on top management control (Appendix S), to the top management, pre-intervention.

No results were obtained during the study, either way, on any effect of this pre-intervention presentation. However, observation during intervention and data from the semi-structured interviews did not present any major differences in cross-case comparison on this potential moderator. No observations were made during intervention, on any cross-case effect of this moderator.

In the semi-structured interviews, post-intervention, four informants could be categorized as “Top Management” representing four separate intervention cases; Sport-One COO, Sport-Two Product Category Director, Foot-One Managing Director and Fashion-Three Managing Director. In the soft measure results, on measures with significant improvement, the first three of these informants note the improvement in range structure performance. The Sport-

Two Product Category Director and the Fashion-Three Managing Director both note significant improvements in objective informed decision-making and in cross-functional alignment.

In constructing the developmental process map, all of these informants contributed “event” data, notably the Foot-One Managing Director (9 out of 16 events) and the Fashion-Three Managing Director (6 out of 16 events). The Sport-Two Director provided data for 4 out of 16 events and the Sport-One COO 2 out of the 16 events. The two events noted by the Sport-One COO were, firstly, recognition that performance and controls were not good enough and secondly on FAC metric “enhancers” and “diminishers”, i.e. the first and last events on the model.

All four of these “top managers” also note their perceptions on the relationship between improving controls and the performance benefits, the consolidation of FAC levels for achieving higher FAC levels and also that the FAC Framework has feasibility, usability and utility.

Though no direct data was captured on any cross-case effect of the Top Management moderator, these overall results and findings would suggest that any cross-case effect is small.

5.3 Escalation of Commitment

In the soft performance measures results “objective informed decision-making” is noted by 8 out of 13 informants as having significant improvement post intervention. This was the measure second most raised by the informants as having significant improvement. Management describe the improved management of “emotion” in the process where there is less reliance on only ‘judgement’ and ‘feeling’ and more decision support with ‘information and facts’. This result was observed by informants from all six intervention cases.

In cross-case comparison, example data from the results on “objective informed decision-making”:

Sport-One COO: ‘*with the emotion getting taken out of it*’

Sport-Two Product Category Director: '*a year ago the entire business was run on judgement*'

Fashion-Three Managing Director: '*now it's got more structure and more objective challenging*'

The results suggest that changing the levels of FAC changes the effect of escalation of commitment, as captured in the Portfolio Performance Framework. This result has been observed across all six intervention cases.

The cross-case moderating effect of escalation of commitment has not been controlled for in the research design. It appears, from the results and the Portfolio Performance Framework development in my previous empirical study (Project 2), that escalation of commitment does have a moderating effect in the study context. However, given the results across all the intervention cases, and the improvement in "objective informed decision-making" and the better management of "emotion", suggests that any cross-case effect in this study is small.

The next section discusses the findings of the project.

6 DISCUSSION

The findings are presented by referring to the three approaches used in the detailed research design (Figure 36) and as noted in the introduction.

First, I explore the findings on changing FAC levels and the changes in portfolio value. Next I review the findings of the process model (Van de Ven, 2007) that explains the "how" of the change. I follow this with a discussion on changing the level of FAC sophistication and changes in strategic alignment. These findings are used to assess the two study propositions.

For supporting the claim on contribution to knowledge of practice, the findings on the practical utility tests, an assessment of the findings on the consolidation of lower levels of FAC to achieve higher levels, and also the use of FAC to

“balance” control and creativity are presented. I also note challenges found to the practical utility of the FAC Framework.

Overall, the findings show how changing to higher levels of FAC sophistication influences NPD management teams to improve portfolio value and strategic alignment. From these findings the contributions are discussed. The contribution to knowledge of practice is also presented, with discussion of the intervention “toolkit”.

Given the relevance test that is core to doing a DBA, the commercial relevance and impact of the study and findings are considered. Finally I discuss the limitations of the study.

Firstly, the FAC levels and portfolio value findings are discussed.

6.1 FAC Levels and Portfolio Value

The results present evidence that management perceive that there is an improvement in NPD portfolio value when there is a change to a higher level of FAC sophistication in the management of the stage-gate process. This finding provides evidence in support of the first proposition.

Firstly, the hard metrics results difference between the intervention and control cases is apparent. For all the intervention cases, where focal unit management assessed increases in FAC sophistication levels, of between two to five levels on the FAC Framework, the cash margin of the aggregate key ranges increased by 14.6% and the cash margin per product (FAC metric) improved by 49.5%. For the control cases, with no observed change in FAC Levels, aggregate range cash margin increased by 7.8% and the cash margin per product decreased by 3.6%.

Secondly, the intervention case management observed significant improvements in three out of the six soft measures of performance on the Portfolio Performance Framework; range structure performance, objective informed decision-making and cross-functional alignment. Management note the improvement in product productivity, more decision support with ‘information

and facts' and improved cross-functional involvement in planning, forecasting and driving performance.

Thirdly, management perceive that there is a direct relationship between increasing the FAC levels of sophistication and improvements in portfolio performance. Management describe how 'going up the ladder' can be used to raise performance, that the change in control and change in performance 'goes hand-in-hand', that 'the two are connected', 'they're definitely related', 'absolutely it's helped performance', 'of course there's a relationship' and 'the seven steps to heaven'. Management note how the intervention, metrics and 'quadrant mapping' has helped change performance.

Fourthly, the Group COO and Group CFO, who review the performance of the group subsidiaries as a key responsibility of their roles, note the post-intervention changes in NPD process controls. They observe the increased use of measures, in particular product productivity. They also point out the improved disciplines in stage-gate review meetings and with a 'more formalized approach'. They observe improvements in 'sales, margin, overhead and cash', product productivity and the achievement of a 'margin dividend'.

Therefore, these findings support the first proposition and that the FAC Framework has practical utility in NPD portfolio performance management.

Next, the findings of the process model are discussed.

6.2 Process Model: Explaining the "How" of the Change

The process model shows, post intervention, how the NPD teams change controls over time. The model provides evidence that suggests how managements' understanding of FAC influences product selection, a crucial finding for the overall study, and why management perceive an improvement in performance. This provides evidence in support of the two propositions.

The model also provides evidence that management is able to use the FAC Framework (feasibility) and that they did use the Framework (usability). Also,

when management use the Framework they find it useful and valuable (utility) in stage-gate NPD portfolio performance management.

There are two key “strands” of change, with both strands closely linked in the process of change (Figure 63). The first strand shows that post intervention management recognise that performance and controls are not good enough. They have the confidence to act and make changes which leads to their motivation to improve process controls and disciplines. From this motivation, management administer the provision of new performance information. The information is used to “kill” easily identifiable products that are highly unlikely to add value. The information, along with the use of new heuristics, is also used to reduce or eliminate product duplication in the portfolio.

The second strand of controls change begins, immediately or early on after the initial intervention, with a longer-term time horizon to changing control and performance. Management consider these control changes as more “strategic”. The FAC Framework is described by NPD management as a “roadmap” that guides the control changes throughout the period of change. The result is greater challenge of portfolio performance leading to a greater focus on portfolio performance. Controls are next changed with the introduction of targets, in overall range size, product categories and the FAC Metric (product productivity e.g. cash margin value per product). This leads to changes in the product review meeting format and content, including more structured forecasting reviews. These forecasting reviews are more collaborative, cross-functional, with more “bottom-up”, granular builds. There is additional analysis, using product portfolio “maps” and improved sense check of the product against strategic plans and targets. Management promote products into the range that enhance the FAC Metric and remove products that dilute the overall FAC Metric.

The result is that NPD management teams perceive an improvement in portfolio performance with a change in controls. The process model shows how the change in FAC happens over time and provides evidence of why NPD management teams perceive an improvement in portfolio performance from the

change in control. When sense-checking the visual map with management, the process of post-intervention change “events” is recognised by management and perceived as achieving an improvement in portfolio performance.

This provides evidence in support of the two propositions.

Next, the findings on changes in strategic alignment are discussed.

6.3 Strategic Alignment

The findings present corroborating evidence (Yin, 2009; Miles and Huberman,1994) that changing to higher levels of FAC influences NPD management teams to improve strategic alignment.

Firstly, six out of thirteen informant managers in the intervention cases observed significant improvements in the soft measure of “cross-functional alignment”. This measure is categorized by the cross-functional NPD management team being “joined-up at the big picture” and achieving a “balance of goals” across the different functional requirements.

Secondly, the process model (Figure 63) shows that a higher level of FAC sophistication seems to influence NPD management teams to carry out more collaborative, granular, product level, “bottom-up” forecasting, as well as forecasting at the total range level. This forecasting activity also includes a simultaneous strategic “fit” check of the granular level product and the total category portfolio against the product category strategy and business strategy, as described in FAC level 3. The findings from the process model also note greater cross-functional challenge in stage-gate review meetings, with more cross-functional focus on performance. This increased cross-functional collaborative activity seems to increase the NPD management teams’ perception of improvement in strategic alignment.

Thirdly, as NPD management teams increase their sophistication in the use of FAC, they appear to increase the cross-checking between short-term targets and longer-term strategy, through the simple strategic “fit” validations at FAC level 3, uncertainty managed with scenario planning at FAC level 5, and target

validation checks at FAC levels 6 and 7. Therefore there is evidence that higher FAC sophistication levels influence NPD management teams to better balance short-term and long-term product development needs and therefore improve strategic alignment (Baker and Bourne, 2014).

Fourthly, the Group COO and Group CFO note, across the intervention cases, a greater team approach, with more cross-functional involvement that is more 'joined-up' on portfolio performance.

These findings provide evidence that supports the second proposition, that changing to higher levels of FAC influences NPD management teams to improve strategic alignment.

Next the FAC Framework practical benefits tests findings are discussed.

6.4 Feasibility, Usability and Utility of the FAC Framework

These results present evidence that management find that the FAC Framework has feasibility, usability and utility in NPD portfolio performance management with large product portfolios and short product lifecycles. The findings support the contribution to knowledge of practice.

When asked directly, management acknowledge the practical benefits of the FAC Framework. Management describe it as a simple, straight forward, structured, logical framework that can be used as a 'tool' to 'have the right conversations' and build control improvements, 'taking one step at a time'. Management also describe the financial and performance benefits of putting the controls in place.

The management perceived relationship that improvements in portfolio performance are achieved with higher levels of FAC sophistication supports the finding that the FAC Framework has practical utility. Also, for one notable event in the process model, where the FAC Framework acts as a "roadmap", management consider the Framework as having "strategic" utility, providing management with guidance, over a longer-term horizon, of how to improve controls in the stage-gate NPD process.

The process model also provides evidence that management is able to use the FAC Framework (feasibility) and that they did use the Framework (usability) and when management use the Framework they find it valuable (utility) in the management of stage-gate NPD.

A finding in my first empirical study, tested in this final empirical study, is that achievement of higher levels of FAC is contingent on consolidation of the lower levels. The results suggest that management perceive that this lower level consolidation is required, with each level acting as a 'foundation' for the next higher level. So management perception, understanding and agreement with this consolidation concept, provides further evidence that management find the FAC Framework has feasibility, usability and utility in NPD portfolio performance management.

These results present evidence that management find that the FAC Framework has feasibility, usability and utility in NPD portfolio performance management with large product portfolios and short product lifecycles.

These findings provide evidence for supporting the contribution to knowledge of practice.

Next the finding of the FAC level consolidation concept is discussed.

6.5 Consolidation of the FAC Lower Levels

The management perception that to achieve higher levels of FAC sophistication requires consolidation of the lower FAC Levels is a finding for practice.

Management describe that achieving consolidation of the lower levels is like having 'solid foundations', and the need to 'learn at each level', with the previous set of skills enabling 'moving on to the next one', moving through 'the stages in a natural progressive way' and 'some of the stuff underneath under-pinning it'.

The concept of balancing control and creativity has been recognised as a challenge for NPD management teams and the findings on control and creativity

support the contribution to practice. These control and creativity findings are discussed next.

6.6 Control and Creativity

A key finding in my systematic literature review was the challenge in NPD of "balancing" control and creativity, where too much control stifles creativity and too little control can cause wasteful and excessive NPD (Cowen and Middaugh, 1998; Peters and Waterman, 1982; Davila, 2000).

In the research design of this study, creativity and NPD are both operationalized as the product range build. In my previous empirical study I noted that to deliver continued value-adding NPD in product range building, grow profits, and avoid excessive and underperforming NPD, a firm in the industry needs to consistently find the "sweet spot" that balances creativity and control (Peters and Waterman 1982 p318; Cowen and Middaugh 1998; Simons 1994; Bisbe and Otley 2004). This requires effective management controls for portfolio management during stage-gate NPD.

The hard metrics results of this project, presented in (Table 15), discussed in the findings on FAC levels and performance, and the improvements in soft perception measures of performance, can be argued as providing evidence that higher levels of FAC sophistication, with an improvement in NPD management controls, can help management better find the "sweet spot" that balances creativity and control.

The earlier findings on FAC levels and performance and the findings in the process model of how change happens over time, provides evidence of the important role of the FAC Metric, as a product productivity metric, in helping to better achieve a balance in control and creativity in the NPD portfolio. Management recognise the FAC Metric as key ratio that has to be managed and is highly practical, a measure that shows the return on investment in design and development for each product. In the intervention cases, a significant improvement in the return on product design and development investment has been achieved.

In a recent paper, that identifies the operational processes of product portfolio decision-making that leads to a ‘set’ of ‘superior’ performing projects, it is claimed that this can be achieved with an ‘embedded portfolio mindset’ making decisions ‘that focus short-term development efforts on projects that will achieve long-term strategic goals’ (Kester et al., 2011). The word “focus” also features in the process model step of “The greater range build performance focus” and “focus” appears to play a crucial role in the change of control that better balances control and creativity. Management discuss ‘focused developments’, ‘less is more’, ‘focusing on what is right for the brand’, ‘avoiding over-development’, ‘not being busy fools’, ‘focusing on what’s working and what isn’t’, ‘thinking about the efficiency of the range’, ‘focusing much more on our weaknesses’, ‘doing less and contributing more’, ‘creating far less products, with bigger quantities behind the products’, ‘stripping out complexity’, ‘we stopped wasting time on projects that weren’t going to get off the ground’, ‘stopping doing stuff that doesn’t work’, ‘getting people to focus on the winners’, ‘less busy and more focused’ and ‘focusing the product range on something that works’.

The Group COO observes this change in the balancing of control and creativity, in the intervention cases:

“I think people have just accepted that it’s a science and not an art. I think there are people in all the businesses that have reached that point. There is still inevitably a differentiation through creativity and innovation, and a good balance of the two. But I think previously it was taken for granted that all of the focus could be on that side of things because we had gone through a decent number of years of an opening labour market in China and that meant you were always able to find whatever you wanted for less than you paid last year. And as that reversed there was a realisation that you were only going to be able to improve things by operating in a far more effective manner.”

Therefore, NPD management teams perceive that the FAC Framework, the FAC Metric and the concept of FAC have utility in “balancing” control and NPD

experimentation. This finding is additional evidence in support of the contribution to knowledge of practice.

6.7 Challenges to the Feasibility, Usability and Utility of the FAC Framework

There are findings that provide evidence of challenges to the practical utility of the FAC Framework. These findings help identify some of the limitations of the practical benefits of the FAC Framework.

A small number of informants, from two of the intervention cases, note soft measures where there was little or no improvement, specifically with up-front planning performance, cross-functional alignment and price architecture performance. This suggests that when there is an increase in the FAC levels it does not improve all the soft performance measures.

Three of the practical challenge observations were made by intervention participants from Sport-One, the case which had the longest period of study. This further suggests that there are limitations of the FAC Framework in changing some of the soft performance measures.

Other challenges to the tests of feasibility, usability and utility were captured. A key concern raised by the Sport-One COO was the ‘language’ on the Framework may be too complicated for designers. The Sport-Two Product Category Director notes that the challenges in moving from one FAC level to the next can be very different, which needs to be understood for use. He also notes that elements of the Framework are ‘not important’ to some people, and this is a challenge to achieving a higher usability and utility.

These findings identify limitations in the feasibility, usability and utility of the FAC Framework. However, on balance, the evidence suggests that the overall benefits outweigh these limitations and there is a net utility of applying the Framework in the management of stage-gate NPD for large complex product portfolios and short product lifecycles.

6.8 Propositions and Contribution

The specific purpose of this final empirical project is to observe how FAC influences NPD management teams to improve portfolio value and strategic alignment. Two propositions developed in my first empirical study (Project 2) are tested in this study:

1) *A change to higher levels of FAC sophistication influences NPD management teams to improve portfolio value.*
2) *A change to higher levels of FAC sophistication influences NPD management teams to improve strategic alignment.*

6.8.1 PROPOSITION 1: PORTFOLIO VALUE

The findings present evidence that management perceive that there is a relationship between raising levels of FAC and the improvement in portfolio performance. The intervention case management that have raised levels of FAC in the NPD process note substantial improvements in NPD and portfolio performance, improvements not observed in the three control cases. Management in the intervention cases also note significant improvements in the soft perception measures of range structure performance, objective informed decision-making and cross-functional alignment. When asked directly of any perceived relationship focal unit management describe how ‘going up the ladder’ can be used to raise performance and that changing FAC levels helps change NPD portfolio performance. The high-level triangulation view across all the intervention cases, observed by the Group COO and Group CFO, supports these findings.

The process model shows, post intervention, how the change in FAC control happens and how this results in the management perception that portfolio performance improves with the change in controls. The process model also provides evidence that management find that the FAC Framework has practical utility. These findings were supported by the evidence obtained when focal unit management were asked directly whether they consider if the FAC Framework has practical utility.

These findings support the first proposition that achieving higher levels of FAC influences NPD management to improve portfolio value.

6.8.2 PROPOSITION 2: STRATEGIC ALIGNMENT

The findings from the soft measure on “cross-functional alignment”, the greater use of collaborative “bottom-up” forecasting identified in the process model, greater cross-functional challenge in stage-gate review meetings and also the Group COO and Group CFO triangulation interviews provide evidence that changing to higher levels of FAC influences NPD management teams to improve strategic alignment

Therefore, the findings of this applied research study support the second proposition, that a change to higher levels of FAC influences NPD management teams to improve strategic alignment.

Having assessed the two propositions I can now identify the contribution of my study. First I discuss the contribution to theoretical knowledge.

6.8.3 CONTRIBUTION TO THEORETICAL KNOWLEDGE

The contribution to theoretical knowledge is in the management control systems sub-field of the performance management of NPD portfolios.

There is a gap in knowledge around how feedforward control in NPD portfolio management influences improvement in portfolio value and strategic alignment. In my study different NPD teams are observed using similar and different types of feedforward control. The use of different types of feedforward control is observed to have different influences on portfolio performance.

My study finds that NPD teams can apply different levels of feedforward control sophistication in NPD portfolio management and that different levels of sophistication have a different influence on NPD portfolio performance. My research has developed a framework of eight different levels of feedforward control sophistication, the FAC Framework, that NPD teams can apply in portfolio performance management.

This framework is new and is a contribution to theoretical knowledge.

Next I discuss the empirical contribution.

6.8.4 EMPIRICAL CONTRIBUTION

I have found an empirical link between the level of FAC sophistication and portfolio performance that has not been demonstrated before. I have found that when NPD teams increase the level of applied FAC sophistication there is a tendency to generate higher portfolio values and greater strategic alignment. This empirical finding is a new contribution to knowledge.

My findings show an apparent difference between the portfolio value improvements of the intervention cases in comparison to those of the control cases. The intervention cases NPD teams observe significant improvements in portfolio performance and perceive that there is a direct relationship between increasing the levels of FAC sophistication and the improvements in NPD portfolio value. The Group COO and Group CFO observe improvements in portfolio values and significant improvements in portfolio productivity in all the intervention cases.

The intervention cases NPD teams perceive significant improvements in strategic alignment and achieving a better balance of goals across the different functional requirements. These NPD teams now carry out more structured, collaborative and granular level forecasting. The Group COO and Group CFO note, across the intervention cases, a greater team approach, with more cross-functional involvement that is more ‘joined-up’ on portfolio performance.

From this work I believe that when NPD teams increase the level of applied FAC sophistication there is a tendency to generate higher portfolio values and greater strategic alignment. I have identified the underlying generative mechanisms of the control changes adopted by NPD teams when moving to higher levels of FAC sophistication. The identification of these mechanisms increases the validity of my research and explains why the tendency exists.

This empirical link between FAC sophistication and portfolio performance is new and an empirical contribution of this study.

Next, the contribution to knowledge of practice is discussed.

6.8.5 CONTRIBUTION TO KNOWLEDGE OF PRACTICE

The contribution to practice is an intervention “toolkit” that combines this action research study intervention approach with the findings of the process model and new analytics. The components of this “toolkit” for practice are discussed in this section.

The intervention has motivated NPD management teams to achieve higher levels of FAC sophistication and the use of FAC at higher levels of sophistication has influenced NPD management teams to improve portfolio value and strategic alignment. Therefore the intervention approach, combined with the findings from the process model and examples of new analytics, can provide a practical “toolkit” for intervention with other NPD management teams, in the context of managing large NPD portfolios, to improve portfolio value and strategic alignment.

This intervention approach therefore represents a contribution to practice. There are four components to the intervention approach developed from the action research study methodology combined with some of the findings.

The first component of the “toolkit” are the intervention graphics, the first graphic representing the stage-gate product review meeting as a control system and the second graphic showing the idea of “balancing” control and creativity (Figures 37 and 38; Appendix CC).

The second component of the approach is the presentation of the two Frameworks, the FAC Framework and the Portfolio Performance Framework (Figure 34 and Figure 35). When presenting the FAC Framework an explanation of each FAC level has been used to assist NPD management teams to understand the differences between each FAC level (Appendix DD). This also includes an explanation of the FAC Metric and its role. The Portfolio

Performance Framework is next presented as a framework to assess the changes in performance with the changes in levels of FAC applied and achieved in the NPD process.

The empirical studies have shown that the use of the FAC Metric provides capability for NPD management teams to guide decision challenges in product selection. Management recognise the metric as a key ratio that has to be managed, is a decision-making “shaping” measure, highly practical and appears to challenge people in a different but meaningful way. The metric shows management a measure of the return on investment that they have made in the design and development for each product.

The third practice intervention component is the presentation of the process model (Figure 63). This can prepare NPD management teams for the “likely journey” when progressing to higher levels of FAC sophistication. Therefore the process model can be used to manage expectation and guide thinking.

The final component of the intervention approach is to present examples of possible new analytics; tail analysis, margin mapping and the forecast uncertainty chart. This provides guidance to NPD management teams by showing “real” examples used by other NPD management teams, where improvements in portfolio value and strategic alignment have been achieved (Appendix EE).

This overall intervention approach is a contribution to knowledge of practice. NPD management teams can use the approach to achieve higher levels of FAC and influence the improvement of portfolio value and strategic alignment.

To a limited extent the quality of the approach was tested in this study, for components one and two, as described above. The results present evidence that management find that the FAC Framework has feasibility, usability and utility in the management of the NPD process (Platts, 1993), where NPD management teams perceive that improvements in portfolio performance and strategic alignment are achieved with higher levels of FAC sophistication. This result was achieved using components one and two of the intervention

approach in the study. The addition of components three and four can strengthen the approach for intervention in practice by assisting NPD management teams to understand the potential outcomes of making the FAC changes.

This intervention approach is new and represents a contribution to knowledge of practice.

The next section discusses the commercial relevance and impact of the contributions of my study.

6.9 Commercial Relevance and Impact

In my first empirical study, when the FAC Framework was sense-checked with knowledgeable informants (Kumar et al., 1993), the findings suggested that there is significant commercial relevance to adoption of the FAC Framework as a guide to improving control and delivering NPD performance improvements. The testing of this finding from my first empirical study has been carried out in this final empirical study and the results presented in the hard metrics analysis (Table 15), showing the change in FAC levels and changes in performance captured in the hard metrics results.

The aggregate results, across the six intervention cases, show a portfolio value increase of 14.6%. This change took place in selected cases with aggregate annual sales of $760m. Post intervention the portfolio productivity, the FAC metric, increased by 49.5%. This hard metric evidence suggests that the use of the FAC Framework in stage-gate NPD, for large product portfolios with short product lifecycles, has commercial relevance and impact.

Next I discuss the limitations of the study.

6.10 Limitations

There are limitations identified in the first empirical study (Project 2) that are still applicable in this study. There are limitations also discussed in this section,

identified in this study, relating to factors not controlled for in the research design.

The limitations discussed include practical challenges of using the FAC Framework, generalizability issues from study in only one industry, the studied cases being predominantly incremental in innovation and not radical innovation, and the literature identified FAC moderators not being tested for effect on performance. Also, for this study, a limitation is the inability to control for other factors driving performance change, not related to changes in FAC sophistication levels.

There were some observed challenges in using the FAC Framework; on “language”, the implications of moving from one FAC level to the next and that elements of the Framework are ‘not important’ to some people. However, on balance, I consider that the evidence suggests that the overall benefits outweigh these limitations.

In my first empirical study (Project 2) the first noted limitation was the study in only a single industry, which can limit generalizability. Therefore research in other industries is required for greater generalizability. The second noted limitation was the innovativeness of the studied cases, which is predominantly incremental. Therefore increased generalizability requires testing in predominantly high radical innovation contexts, with large product portfolios.

My first empirical study (Project 2) also considered the literature identified moderators. This has also been noted in this study, especially for the moderators not controlled for in the design. To achieve a more complete understanding of the role of FAC in the management of stage-gate NPD, the effect of changing all these moderators will have to be studied. Therefore, this study is limited by not testing for each of these moderators’ effects when changing FAC levels.

A limitation is the presence of contextual factors that can effect performance, other than changing the levels of FAC sophistication. A number of such factors captured in this project were presented in the findings as having a significant

improvement on portfolio performance but not related to changes in FAC levels. The use of the control cases helps manage this limitation. However, these findings show that there were other changes occurring, effecting portfolio performance, that I was unable to control for in the design. This presents a limitation on the findings, especially for any claim on a relationship between changing FAC levels and changes in performance.

7 PERSONAL REFLECTION

This section is a brief personal reflection on the project and the findings obtained in this final stage of the overall research study.

As with my previous empirical study, the quality and volume of data obtained has been achieved by having very good access to focal unit management.

My role as a manager within the organisation involves responsibilities that assess and review risks and help implement actions to manage those risks. Therefore this study and the research intervention are compatible with those role responsibilities. I believe this has helped in managing the access and delivering the intervention.

I conclude that adopting the engaged scholarship research framework (Van de Ven, 2007) has enhanced the impact of the intervention on the organisation. I conclude, for myself, that undertaking the Cranfield DBA has helped me find a solution to better manage the performance of NPD in the organisation and has also helped develop contribution to theoretical knowledge. I believe that this type of study and research design bridges the relevance gap and can transform knowledge into action.

The conclusions reflect the achievement of the objectives of this study and the provision of answers to the research question guiding the study.

8 CONCLUSIONS

The purpose of this study, through applied empirical research, is to observe how raising the level of applied FAC sophistication influences NPD teams to

improve portfolio value and strategic alignment. The findings present a contribution to management controls systems theory, in the sub-field of the performance management of NPD portfolios. From this work I believe that when NPD teams increase the level of applied FAC sophistication there is a tendency to generate higher portfolio values and greater strategic alignment.

I have also found a contribution to knowledge of practice with an intervention "toolkit" that can motivate NPD management teams to achieve higher levels of FAC. Part of the toolkit is the FAC Framework. NPD management teams find that the FAC Framework has practical utility in NPD portfolio management and that with higher levels of FAC sophistication NPD management teams perceive an improvement in NPD portfolio value and strategic alignment.

The use of the FAC Framework and application of the FAC Metric helps management achieve a better balance of control and creativity in the NPD portfolio. The achievement of higher levels of FAC sophistication is contingent on consolidation of the lower levels of FAC.

These findings have helped answer the research question and have been used to identify improvements to the performance management of NPD portfolios, in the context of the large portfolios with short product lifecycles. Finding ways to improve NPD portfolio performance management is the business challenge driving this overall research study.

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APPENDICES

APPENDIX A Database Searches and Results
1st Stage: Title + Abstract, including duplicates

SEARCH STRINGS – Scholarly Journals	**ABI/Inform Global**	**Selected Stage 2**	**EBSCO Business Source Complete**	**Selected Stage 2**	**Included in FINAL PAPERS**
(manage* control* OR control* system* OR manage* system*) AND (innovat* OR creativ* OR product innovat* OR product develop* OR initiativ* OR change) AND **(boundar* OR hurdle* OR limit* OR level*)** AND NOT (quality OR software OR comput* OR government OR public OR health OR CRM OR sigma OR human resource*)	19 Feb 11 339	**26**	2 Mar 11 606	**18**	**17**
(manage* control* OR control* system* OR manage* system*) AND (innovat* OR creativ* OR product innovat* OR product develop* OR initiativ* OR change) AND **(feed-forward OR feed forward OR forecast* OR planning OR predict* OR scenario*)** AND NOT (quality OR software OR comput* OR government OR public OR health OR CRM OR sigma OR human resource*)	25 Feb 11 374	**34**	4 Mar 11 438	**10**	**18**
(performance measure* OR performance manage* OR performance system* OR performance assessment OR performance evaluat* OR performance indicat* OR scorecard*) AND (product develop* OR innovat* OR creativ* OR product innovat* OR initiativ* OR change) AND **(boundar* OR hurdle* OR limit* OR level*)** AND NOT (quality OR software OR comput* OR government OR public OR health OR CRM OR sigma OR human resource*)	26 Feb 11 694	**35**	5 Mar 11 638	**30**	**25**

SEARCH STRINGS – Scholarly Journals	ABI/Inform Global	Selected Stage 2	EBSCO Business Source Complete	Selected Stage 2	Included in FINAL PAPERS
(performance measure* OR performance manage* OR performance system* OR performance assessment OR performance evaluat* OR performance indicat* OR scorecard*) AND (product develop* OR innovat* OR creativ* OR product innovat* OR initiativ* OR change) AND **(feed-forward OR forecast* OR planning OR predict*)** AND NOT (quality OR software OR comput* OR government OR public OR health OR CRM OR sigma OR human resource*)	28 Feb 11 554	**37**	6 Mar 11 336	**11**	**16**
(performance measure* OR performance manage* OR performance system* OR performance assessment OR performance evaluat* OR performance indicat* OR scorecard*) AND (product develop* OR innovat* OR creativ* OR product innovat* OR initiativ* OR change) AND **(scenario*)** AND NOT (quality OR software OR comput* OR government OR public OR health OR CRM OR sigma OR human resource*)	28 Feb 11 30	**2**	6 Mar 11 50	**0**	

APPENDIX B STAGE 2: INITIAL REVIEW OF PAPERS FROM STAGE 1

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
1	Ahn, H. and Dyckhoff, H. (1997)			Conceptual decision support system for evaluation and selection of product development activities. Focus on using systems engineering (SE) to manage simultaneous decisions and reduce development time. For use in replacing sequentially staged processes.	
2	Ambrosio Orizaola, E. M. (1991)			Not an academic paper. Relevant only to refractory industry.	
3	Andersen, T. and Nielsen, B. (2009)			Outlines an adaptive strategy making model to incorporate operationalized measures of intended and emergent strategy modes.	
4	Ansoff, H. I. and Sullivan, P. A. (1993)		Discusses continual strategic environmental monitoring by firms, “assess future inherent profitability and growth in historical markets”		
5	Aramburu, N., Sáenz, J. and Rivera, O. (2006)			Not relevant on innovation or controls.	
6	Baker, N. R. and Freeland, J. R. (1972)		Information system requirements for innovative processes		Describes the importance of information flow in the innovative process
7	Bart, C. K. (1993)	A study of controls and new product R&D. Need for balance in setting ‘loose’ and ‘tight’ controls. Control patterns may need to vary depending on NPD strategy.			

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
8	Bart, C. K. (2002)	Product Innovation Charter (PIC). Policies to guide NPD activities. "Discretion to make decisions but only in acceptable boundaries". "Loose-tight controls". PICs and performance measures.			
9	Bergmann, R. and Friedl, G. (2008)			Study of optimal incentive contracts offered to R&D managers. Positivist and mathematical study.	
10	Bisbe, J. and Malagueno, R. (2009)	Patterns of fit between Innovation Management Modes (IMM) and selection of Management and Accounting Control Systems (MACS) and implications on product innovation outputs.			
11	Bititci, U. S., Turner, T. J. and Ball, P. D. (1999)			Viable Systems Model (VSM) for managing agility. Not a study on innovation or NPD.	
12	Bonner, J. M., Ruekert, R. W. and Walker Jr., O. C. (2002)	Studies the relationship between manager's use of mechanisms for controlling NPD and the effect on NPD performance.			
13	Booker, D. M., Drake, A. R. and Heitger, D. L. (2007)	Effects of cost information precision and type of NPD on a designer's cost focus.			
14	Bordoloi, S. and Guerrero, H. (2008)			Systems used to control a manufacturing process with design or re-design of a product or process. Design for control (DFC).	
15	Bourne, M., Kennerley, M. and Franco-Santos, M. (2005)			Not a study of innovation or NPD.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
16	Brühl, R., Horch, N. and Osann, M. (2010)		Improving integration capabilities between innovation and operations processes through the use of management controls. Study focus is on integration capabilities. (May need full paper review – some aspects of development capabilities?).		
17	Bruining, H., Bonnet, M. and Wright, M. (2004)			Study of management controls and Management Buy-outs (MBOs) not innovation or NPD.	
18	Burton, R. M., Forsyth, J. D. and Melick, D. M. (1988)	Concept of “Steering” versus management controls in planning . Planning, tracking, assessing while simultaneously interacting with the environment on a continual basis.			
19	Calantone, R., Garcia, R. and Droge, C. (2003)		The effect of turbulent environments on NPD performance. Involvement of strategic planners in NPD and vice versa.		
20	Carpinetti, L., Gerolamo, M. and Galdámez, E. (2007)			Study of the process of planning and implementing actions for continuous innovation in SME clusters.	
21	Chen, G. and Muller, A. (2010)			Not a peer reviewed academic paper.	
22	Chesbrough, H. (2004)			Not a peer reviewed academic paper.	
23	Chiaroni, D., Chiesa, V. and Frattini, F. (2010)			Organization changes moving from closed to open innovation.	
24	Chiesa, V. (1999)			Deals with the management of foreign R&D units. Balancing central control and autonomy of the unit.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
25	Chiesa, V. and Frattini, F. (2007)	Contribution to value is a key performance measure in research activities.			
26	Chiesa, V., Frattini, F., Lamberti, L. and Noci, G. (2009)	Study of management controls (Simons LOC) in innovation projects to explore the impact of project radicalness on these management controls practices.			
27	Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2007)A	The use of PMS with NPD. Some discussion that too much formal performance measurement may limit innovation.			
28	Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2007)B	R&D PMS and measurement objectives. Discusses Simons LOC application in R&D PMS.			
29	Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2009)	Studies PMS, R&D and control. One finding – relationship between development activities and PMS, in project profitability evaluation. Prevalence to do this sort of evaluation.			
30	Christiansen, J. K. and Varnes, C. J. (2007)			Looking at linear management perspective and network process perspective of innovation.	
31	Ciappei, C. and Simoni, C. (2005)	Develop closer relationships with customers to catch early and weak signs, emerging needs and trends, to improve NPD capability. Footwear industry study. Implementation of trend forecasting and research methodologies.			

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
32	Claycomb, C., Droge, C. and Germain, R. (2001)			Not relevant on innovation or controls.	
33	Collier, P. M. (2005)		Study of control mix. Single case study, entrepreneurial company. Considers Simons 1995 and Ferreira and Otley 2005. Importance of boundary systems is discussed. No NPD specific study.		
34	Cooper, R. G. and Edgett, S. J. (2003)	Present 9 reasons why NPD projects exceed resources, including; effective go/kill decision points and portfolio management gating in the process. Use of (predictive) strategy planning maps.			
35	Corbin, R. H. (1980)			Not a peer reviewed academic paper.	
36	Cordero, R. (1990)	Discusses measuring marketable outputs in innovation and measuring during the planning stage. Presents a model but no supporting empirical study.			
37	Cowen, S. S. and Middaugh, J. K.,II (1988)	Discusses the risks on innovation of implementing planning and control systems that are too formal. The need to maintain the successful characteristics and not stifle innovation.			
38	Cowen, S. S. and Middaugh, J. K.,II (1990)			Matching of a planning and control system to its environment but not a study of innovation or NPD.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
39	Danneels, E. and Kleinschmidt, E. J. (2001)	The relationship between product innovativeness and Go/No Go decisions. Suggests that managers should evaluate on degree of fit with firms technological and marketing competencies.			
40	De Bandt, J. (1995)			Theoretical paper on the different levels of evaluating R&D; centralized/decentralized; technology; socio-economic; decision processes; activities.	
41	Dent, J. F. (1990)			Not a study of control systems and innovation. Discussion on accounting and control systems potential pro-active role in strategic change.	
42	Durmusoglu, S. S., McNally, R. C., Calantone, R. J. and Harmancioglu, N. (2008)	Simple metrics may be useful in NPD strategy change targets to SBUs but they may result in short term responses that can ultimately harm the firm.			
43	Dye, R. A. (2004)			Not relevant on innovation or controls.	
44	Eilon, S. (1993)			An editorial and not relevant on innovation or controls.	
45	Eppler, M. J. and Sukowski, O. (2000)			Not relevant on innovation or controls.	
46	Francis, M. (2009)	Study of a linear sequential stage gate NPD process. Designing an appropriate PMS into the NPD process to manage the characteristics of success and failure.			References Booz Allen and Hamilton (1982); mortality of new product ideas.
47	Frigo, M. L. (2002)A			Not a peer reviewed academic paper.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
48	Frigo, M. L. (2002)B			Not a peer reviewed academic paper.	
49	Frow, N., Marginson, D. and Ogden, S. (2005)	Study of the use of management controls to balance the tension between budgetary control and strategic renewal. NPD discussed in the case study. Reconciling 'predictable goal achievement', individually based budgetary control and pursuit of strategic adaption.			
50	Fu, Y. (2010)	Taiwanese SMEs; NPD and performance measures. Concludes that managers need to be aware of NPD success factors and select appropriate measures at start of process. Challenge of setting financial and non-financial NPD goals.			
51	Gimbert, X., Bisbe, J. and Mendoza, X. (2010)			Study of SPMS and strategy formulation, as different from strategy implementation.	
52	Gomes, C. F., Yasin, M. M. and Lisboa, J. V. (2011)			PM in Portugese manufacturers. Not relevant on controls and innovation.	
53	Greve, H. R. (1998)	Evidence that aspiration levels have decision-maker behavioural and risk taking consequences.			
54	Greve, H. R. (2002)			Speed of aspiration level updating. Not relevant on controls and innovation.	
55	Helm, R., Scholl, A., Manthey, L. and Steiner, M. (2004)	Knowledge of customer needs in innovation planning. Preference elicitation techniques such as conjoint analysis (CA) and analytic hierarchy process (AHP).			BL Copy

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
56	Henard, D. H. and Szymanski, D. M. (2001)	Meta-analysis of the empirical literature on NPD success and failure. Interesting findings on inaccurate managerial perceptions and poor NPD performance.			
57	Hertenstein, J. H. and Platt, M. B. (2000)	Study of NPD, management controls and PMS. One key finding; firms want more explicit links between strategy and NPD process, especially to guide NPD.			
58	Holmes, M. F. and Campbell, R. B.,Jr (2004)	Proposes more effective integration of business objectives into the NPD end-to-end process. Also proposes and integral closed feedback loop.			
59	Holt, K. (1970)	Early paper; with a large number of products and product projects a more mechanistic system is required for control. Idea of a mechanistic and an organic system.			
60	Hong, P., Doll, W. J., Nahm, A. Y. and Li, X. (2004)			Study of 'shared knowledge' in NPD, not management controls.	
61	Ishikawa, A. and Smith, C. H. (1972)	Feed-forward control in a planning and control system.			
62	Islei, G., Lockett, G. and Stratford, M. (1990)	Judgemental modeling, multi-criteria decision making, R&D attributes word model and attribute weighting in the chemical industry (ICI).			
63	Jalonen, H. and Lönnqvist, A. (2009)			Not relevant on innovation or controls.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
64	Jang, N., Dickerson, K. G. and Hawley, J. M. (2005)		Measures of apparel product success and failure. Not a study of control information during the NPD process. A study of outcome review measures.		
65	Jørgensen, B. and Messner, M. (2009)	Using enabling controls to balance efficiency and flexibility in NPD. Study identifies NPD tensions between efficiency and flexibility.			
66	Kahn, K. B., Barczak, G. and Moss, R. (2006)	Study proposes a best practice framework for NPD process using benchmark data from published studies. Includes; portfolio management, evaluation criteria and metrics. The risks of too much formalization is discussed.			
67	Kanter, R. (1985)	Administrative mgt versus entrepreneurial mgt in NPD. Making sure control systems do not present roadblocks. Portfolio approach. Origin of “some things loose and some things tight”.			
68	Kaplan, R. S. (1994)			Not a peer reviewed academic paper.	
69	Kaplan, R. S. and Norton, D. P. (2005)			Not a peer reviewed academic paper.	
70	Karlsson, C. and Åhlström, P. (1997)	5 Lessons on NPD strategy development process. Lesson 2; marketing issues should be part of each function’s responsibilities in NPD.			
71	Kimura, S. and Mourdoukoutas, P. (2000)	Use of interactive control systems to refine market information.			

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
72	Klueh, R. (1981)			Not a peer reviewed academic paper.	
73	Kolehmainen, K. (2010)			Dynamic SPMS; not relevant on controls and innovation.	
74	Koontz, H. and Bradspies, R. W. (1972)	Feed-forward controls, including discussion on feed-forward in NPD.			
75	Kortge, G. D. and Okonkwo, P. A. (1989)	Simultaneous development and integration of the product and strategy development processes. Discusses NPD failure due to deficiencies in market analysis and sales forecasting.			
76	Laitinen, E. K., Wingren, T. and Nixon, W. A. (2004)			Study of how the mix of management controls changes in technology companies. Not a study of NPD and controls.	BL Copy
77	Langfieldsmith, K. (1997)	Studies research on management controls and strategy, including strategic variables on product development (prospectors, defenders and analyzers).			
78	Leonard-Barton, D. (1992)	Core NPD capabilities can inhibit as well as enable development. Core capabilities and dysfunctional flipside core “rigidities”.			
79	Lilien, G. L., Morrison, P. D., Searls, K., Sonnack, M. and von Hippel, E. (2002)			The effect of “lead-user” (LU) idea generation on NPD performance. Study not done from a control perspective. Study compares LU versus non LU performance.	
80	Linder, J. C. (2005)			Poor quality article; no literature review, a conceptual paper with no supporting evidence and no research question. Appears to be practitioner focus only.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
81	Loch, C. H. and Tapper, U. A. S. (2002)	R&D applied research perspective: achieving strategic alignment of R&D through PM.			
82	Lyneis, J. M. (2000)			A study of the use of system dynamics models, capturing the causes of industry dynamics, to improve industry forecasting. Example with commercial jet demand. Not relevant on NPD or control.	
83	Makridakis, S. (1986)	Accomplishments and shortcomings of forecasting.			
84	Mankin, E. (2007)			Not a peer reviewed academic paper.	
85	Marginson, D. E. W. (2002)	Study of how management controls can affect ideas and initiatives within the firm. Some discussion on balancing the tension between innovation and control. Paper informed by Simons LOC. Middle management level focus.			
86	Marinova, D. (2004)		The effect of market knowledge diffusion on firm innovation and the dynamic use of market knowledge on innovation. Concludes that updating and sharing of market knowledge increases innovation effort and returns. Theoretical paper.		
87	Martinez, V., Pavlov, A. and Bourne, M. (2010)		The use of Performance Management Reviews (PMRs), management controls and managerial intervention. PMR content, process and context (Pettigrew et al.)		
88	Melnyk, S. A., Calantone, R. J., Luft, J. and Stewart, D. M., Zsidisin G.A., Hanson, J., Burns L. (2005)			Not a study of management controls and innovation. A study of metrics alignment.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
89	Meyer, M. H., Tertzakian, P. and Utterback, J. M. (1997)		R&D metrics, determining when product platforms are obsolete and need replacing. Development of new platforms and platform extensions - derivative products.		
90	Michael, S. R. (1980)			Not a peer reviewed academic paper.	
91	Micheli, P. and Manzoni, J. (2010)	Resolving apparent paradoxes of SPMS. 1) Explicit choice of strategic or operational 2) design depends on role; leading or lagging 3) balance consequences between 'diagnostic' and 'interactive'; active role on innovation.			
92	Mills, A. E. (1970)			Basic study on how management control can enhance integrated planning and control thinking.	
93	Minin, A. D., Frattini, F. and Piccaluga, A. (2010)			Open innovation (versus closed) as an emerging strategic approach to innovation management: example of Fiat.	
94	Montagna, F. and Norese, M. F. (2008)			Modelling of design and development processes, not from a control perspective.	
95	Moorman, C. (1995)	Importance of conceptual marketing information utilization processes on improving NPD performance. Conceptual utilization processes; indirect use of information in strategy related actions. Discusses the format of this information processing.			
96	Morlidge, S. (2010)			Not a peer reviewed academic paper.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
97	Morris, M. H., Allen, J., Schindehutte, M. and Avila, R. (2006)	The characteristics and type of control can facilitate entrepreneurial behaviour. Empirical evidence that control systems impact the level of entrepreneurship.			
98	Mosey, S. (2005)			How SMEs build dynamic capability for new to market product development. Empowerment of cross-functional teams to evaluate new technologies.	
99	Nakahara, T., Matsuda, Y. and Motoyoshi, K. (1979)	Forecasting of R&D using a profitability method. Categorization of different project forecast patterns. Concludes to: analyze effectiveness of past forecasts and inform managers of current forecasts.			
100	Nixon, B. (1998)	R&D performance measurement single case study. R&D evaluation included; quantitative, objective, strategic orientation, reflected CSFs, balanced between financial and non-financial, supported collaboration.			
101	O'Connor, G. C. (2008)			Theoretical study of radical innovation dynamic capability using systems theory.	
102	O'Donnell, F. J. and Duffy, A. H. B. (2002)			Modelling of design development performance; efficiency and effectiveness. Not a study of control during NPD.	
103	O'Grady, W., Rouse, P. and Gunn, C. (2010)			Not a study of control and innovation or NPD.	

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
104	Omta, S. W. F., Bouter, L. M. and Van Engelen, J. M. L. (1994)		Study of control and innovation in pharmaceutical R&D but not from boundary or feed-forward perspective. Study perspective on; personnel controls and planning meetings.		
105	O'Regan, N. and Ghobadian, A. (2005)			Compares engagement in NPD between prospectors and defenders (Miles and Snow (1978) categorization. Note - other categories; analysers, reactors.	
106	Othman, R. (2008)			Linking the balanced scorecard with scenario planning. Not a study of control and NPD.	
107	Paladino, A. (2009)	Study finding that a low degree of resource and market orientation (MO) in NPD leads to inferior performance. A significant interaction effect between MO and innovation. MO also has a significant effect on performance.			
108	Park, C. K. (1998)	The use of dynamic control mechanisms to effect programmed and emergent innovation. Mechanisms; administrative, institutional, cultural, game-theoretic, affective.			
109	Park, K. M. (2007)			Study finding that aspiration, performance and their interactions with competitor's performance strongly affect the direction of strategic change. Not a study of NPD or control.	
110	Pattikawa, L. H., Verwaal, E. and Commandeur, H. R. (2006)	Meta- analysis of empirical papers. Firms with a strong market orientation and proficiency in NPD are most likely to realize high new product performance.			

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
111	Piest, B. and Ritsema, H. (1993)			Low quality article – no literature review. Concepts presented with poor evidence.	
112	Poskela, J. and Martinsuo, M. (2009)	Study of management controls at the front-end of innovation. Specification of strategic performance goals as an 'input control' is a key ingredient in promoting strategic renewal.			
113	Radosevich, R. (1977)	Desirable characteristics of 'formal' systems for innovative business units.			
114	Ramsey, J. E. (1981)	The use of measurement yardsticks and goal values to make product decisions in product development.			
115	Revellino, S. and Mouritsen, J. (2009)	Study of how management controls are involved in development of innovation. Case study of Autostrade in Italy. Study illustrates a multiplicity of controls in innovation.			
116	Riccaboni, A. and Leone, E. L. (2010)			The role of management controls in implementing sustainability strategies. Not and NPD or innovation study.	
117	Rice, M. P., O'Connor, G. C., Peters, L. S. and Morone, J. G. (1998)	Study of the stimulation of discontinuous, breakthrough innovation. Aspects of evaluation that look at forecast value estimation.			
118	Richtnér, A. and Åhlström, P. (2006)		Categories of organizational slack at NPD project levels; project deliverables slack, human competence slack, customer interaction slack, top management control slack. Not a study of boundary or feed-forward controls.		

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
119	Richtnér, A. and Åhlström, P. (2010)	A study of top management informal controls in stimulating NPD. Top management informal control focuses on explicit knowledge and not tacit knowledge. Suggestions for practice.			
120	Rogers, H., Ghauri, P. and Pawar, K. S. (2005)	Performance measures used to evaluate NPD process; enabling metrics, core process metrics, project output metrics.			
121	Rook, J. and Medhat, S. (1996)			Not a peer reviewed academic paper.	
122	Salomo, S., Talke, K. and Strecker, N. (2008)			A study of innovation field orientation and the performance effects of this approach. Not a study of boundary or feed-forward controls and NPD.	
123	Salvato, C. (2009)		Capability renewal and adaptive capability development . 15 Year study of NPD at Alessi. The role of capability evolution in underpinning organizational renewal.		
124	Saunders, J., Wong, V., Stagg, C. and Fontan, M. M. S. (2005)	NPD within FMCG brand development; how screening and evaluation criteria change over the NPD process. Two significant evaluations for brand development; compelling market potential and lucrative potential market. Interesting for Branding and NPD.			
125	Schmidt, J. B. and Calantone, R. J. (1998)	Study of how managers evaluate NPD projects. Finding that there is a greater likelihood of continuing with risky NPD when the product is more innovative. Psychological commitment.			

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
126	Schmidt, J. B. and Calantone, R. J. (2002)	Study of the escalation of commitment in NPD. Product passing stage gates with poor forecasts when managers committed to a high innovation product. Empirical evidence of information biaising.			Information biaising and escalation of commitment effects.
127	Shankar, R., Acharia, S. and Baveja, A. (2009)			The use of soft system methodology in knowledge management initiatives during NPD. Not a study of boundary or feed-forward controls.	
128	Simons, R. (1994)	Top management levers of control; belief, boundary, diagnostic, interactive. Use of interactive planning systems to focus attention on NPD. Boundary systems allowing creativity within defined limits of freedom.			
129	Song, M., van der Bij, H. and Weggeman, M. (2006)			A study of knowledge generation in NPD. Potential controllable managerial antecedents; information technologies, individual commitment, R&D budget and job rotation.	
130	Spithoven, A., Frantzen, D. and Clarysee, B. (2010)			The impact of “open” innovation and knowledge exchange on product innovation. Also, the importance of research intensity. Not a study of control and innovation.	
131	Styhre, A. (2006)			Knowledge management in science based product innovation.	
132	Tapinos, E., Dyson, R. G. and Meadows, M. (2005)		Performance measurement is a key factor in strategic planning. PMS has a critical role in translating strategy into action. PMS has a supporting role in the development of strategies.		

	PAPER	CORE	PERIPHERY	REJECTION	OTHER COMMENT
133	Taylor, B. (1976)	5 Dimensions in corporate planning of which one is 'Planning as a framework for innovation'. Discusses 'organized entrepreneurship' and 'institutionalized innovation'.			
134	Tita, M. A. and Allio, R. J. (1984)			Not a peer reviewed academic paper.	3M portfolio management. Maturity vs competitive position.
135	Tomovic, C., Ncube, L., Walton, A. and Grieves, M. (2010)			Study of the metrics used to assess Product Lifecycle Management (PLM) investment performance.	
136	Vitale, M., Mavrinac, S. C. and Hauser, M. (1994)			Not a peer reviewed academic paper.	
137	Wang, K., Lee, Y., Wang, S. and Chu, C. (2009)			Development of a systems dynamic model of NPD to examine resource allocation strategies.	
138	Wu, H. (2008)			Agency and stakeholder perspectives of corporate governance in enhancing firm product innovation.	Taiwanese firms.
139	Wynder, M. (2007)	Study considers the development of a control system that supports creativity. Contingent control approach dependent on individual's domain relevant knowledge.			
140	Yin, Y., Qin, S. and Holland, R. (2011)			Measurements to improve collaborative design.	
	TOTALS	**61**	**13**	**66**	

APPENDIX C STAGE 3: ADDITIONAL PAPERS FOUND WHILE OBTAINING STAGE 1-2 PAPERS

	PAPER	CORE	PERIPHERY	REJECTION
1 (141)	Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2008)		Study of how to design a PMS for an R&D function. Biotech case study.	
2 (142)	Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2009b)		Study of how to design a PMS for an R&D function. Italian R&D intensive firms.	
3 (143)	Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2009c)		Study of how to design a PMS for an R&D function. 15 Italian technology intensive firms.	
4 (144)	Christiansen and Varnes (2009)	The use of structured approaches to NPD. The rules are described as a sense-making process influenced by context and feedback. Sense-making can change a mandatory system to a possible checklist.		
5 (145)	Cooper et al. (2002)	Building more effective go/kill decision points in NPD stage-gate processes. Careful scrutinization, weak projects really 'killed'. Operational, realistic and discriminating stage-gate criteria. Use of "must meet" and "should meet" criteria. Building strategic criteria into the stage-gate process. Gate meetings are a 2 part decision process.		
6 (146)	Harmancioglu et al. (2007)	Industry competitive intensity is positively related to the use of a solid business case and also customer input and feedback. Innovators face the challenge of balancing formality and flexibility.		
7 (147)	Holt (ISMO) 1976		Assessment of market needs in innovation.	
8 (148)	Kanter (HBR) 2006	Use of the innovation pyramid. Hurdles too high, scope too narrow. Tight controls strangle innovation.		

	PAPER	CORE	PERIPHERY	REJECTION
9 (149)	McNally et al. (2007)			Not a peer reviewed academic paper
10 (150)	McNally et al. (2009)	Studies managers dispositions in relation to New Product Portfolio Management (NPPM). The higher the manager's ambiguity tolerance in NPD the more likely the strategic fit dimension will involve examination of latent customer needs to develop non-incremental new products. The more analytic the manager's cognitive style, the more likely there is a detailed examination of multiple criteria.		
11 (151)	Pattikawa et al. (2002)		Meta-analysis showing that variables such as top management support, communication and information exchange, integration, management skill, resources and marketing synergy possess stable and significant relationships with NPD.	
12 (152)	Christiansen and Varnes (2008)	Study of the behavior of decision makers in portfolio management meetings on innovation projects.		
	TOTALS	**6**	**5**	**1**

APPENDIX D STAGE 5: ADDITIONAL PAPERS FOUND FROM FULL PAPER REVIEW REFERENCES

	PAPER	CITED IN	CORE	PERIPHERY
1 (153)	Goold and Quinn (1990)	Langfield-Smith (1997)		Controls accommodating uncertainty and flexibility, to assist judgement. Problems and complexity of strategic control.
2 (154)	Simons (AOS) (1987)	Simons (1994); Langfield-Smith (1997); Kimura and Mourdoukoutas (2000); Hertenstein and Platt (2000); Davila (2000); Revellino and Mouritsen (2009)	Importance of forecast data in control systems.	
3 (155)	Miller and Friesen (1982)	Langfield-Smith (1997); Harmancioglu et al. (2007); Revellino and Mouritsen (2009); Bisbe and Malagueno (2009)	Information processing and analytical and strategic planning processes in NPD.	
4 (156)	Crawford (1980)	Karlsson and Ahlstrom (1997); McNally et al. (2009)		Product Innovation Charter (PIC) origin article.
5 (157)	Cooper (1990)	Schmidt and Calantone (1998); Saunders et al. (2005)		Initial paper on stage-gate systems, outlines the concept.
6 (158)	Davila (2000)	Morris et al. (2006); Booker et al. (2007); Revellino and Mouritsen (2009); Poskela and Martinsuo (2009); Jorgensen and Messner (2009); Bisbe and Malagueno (2009); Christiansen and Varnes (2009)	Management control systems and product development. Study of the drivers of management controls design in NPD.	
7 (159)	Shih and Yong (2001)	Morris et al. (2006)		Strategic typology: prospector decision-making more geared to the longer term, being creators of change in an industry.
8 (160)	Cooper and Kleinschmidt (1990)	Danneels and Kleinschmidt (2001); Schmidt and Calantone (2002); Saunders et al. (2005)	Dificulties in operationalizing stage-gate criteria. Explicit decision rules used to make the “kill” decision.	
9 (161)	Montoya-Weiss and Calantone (1994)	Schmidt and Calantone (1998); Danneels and Kleinschmidt (2001); Bart (2002); Schmidt and Calantone (2002); Ciappei and Simoni (2005); Pattikawa et al. (2006); Durmusoglu et al. (2008); McNally et al. (2009)		Meta-analysis; strategic factors and development process factors in new product performance.
10 (162)	Godener and Soderquist (2004)	Chiesa et al. PMJ (2007)	Use of feed-forward metrics in NPD.	

	PAPER	CITED IN	CORE	PERIPHERY
11 (163)	Bisbe and Otley (2004)	Morris et al. (2006); Revellino and Mouritsen (2009); Poskela and Martinsuo (2009); Christiansen and Varnes (2009)	The interactive use of management controls and innovation.	
12 (164)	Widener (2007)	Revellino and Mouritsen (2009); Bisbe and Malagueno (2009)		Strategic uncertainties and strategic risk drive the importance and role of control systems.
13 (165)	Griffin and Page (1996)	Hertenstein and Platt (2000); Loch and Tapper (2002); Bart (2002); Cooper and Edgett (2003); Saunders et al. (2005); Rogers et al. (2005); Ciappei and Simoni (2005); Harmancioglu et al. (2007); Francis (2009)		General view of use of measures in NPD.
14 (166)	Griffin (1997)	Hertenstein and Platt (2000); Schmidt and Calantone (2002); Saunders et al. (2005); Ciappei and Simoni (2005); Kahn et al. (2006); Morris et al. (2006); Poskela and Martinsuo (2009); Francis (2009); McNally et al. (2009); Christiansen and Varnes (2009)		Measures trends in NPD processes.
15 (167)	Amabile (1998)	Davila (2000); Revellino and Mouritsen (2009); Poskela and Martinsuo (2009)		Control and creativity; managers undermining autonomy by continually changing goals and interfering with processes.
16 (168)	Ouchi (1979)	Davila (2000); Bonner at a. (2002); Durmusoglu et al. (2008); Revellino and Mouritsen (2009); Poskela and Martinsuo (2009); Richtnér, A. and Åhlström (2010)		Mechanisms to manage an organization so that it moves towards its objectives. 3 mechanisms; markets, bureaucracies and clans.
	TOTALS		**6**	**10**

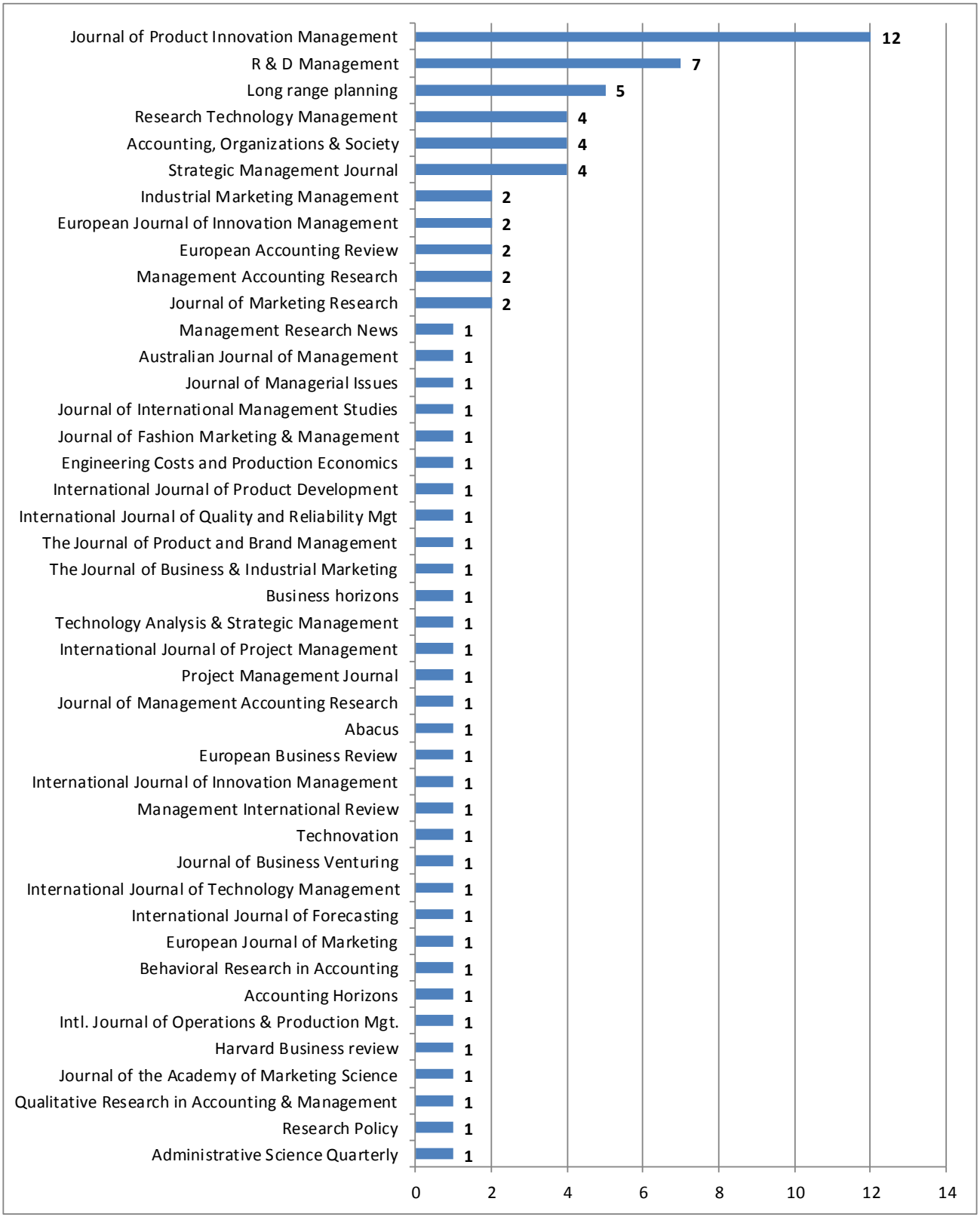
APPENDIX E STAGE 12: RE-RUN OF DATABASE SEARCHES - APRIL 2013

	PAPER	CORE	PERIPHERY	REJECTION
1 (169)	Kester, L., Griffin, A., Hultink, E.J. and Lauche, K. (2011)	A study on how firms make NPD portfolio decisions		
2 (170)	Martinsuo, M. and Poskela, J. (2011)	How the use of evaluation criteria is associated with innovation performance		
3 (171)	Rijsdijk, S.A., and Van den Ende, J. (2011)		The use of outcome, clan and process controls in NPD	
4 (172)	Akroyd, C. and Maguire, W. (2011)	Management control and goal congruence in NPD decision gates		
5 (173)	Lerch, M. and Spieth, P. (2012)		A systematic literature review meta-analysis on empirical research papers on innovation project portfolio management (IPPM)	
6 (174)	Gemser, G., Leenders, M.A.A.M. and Weinberg, C.B. (2012)		A study of whether later-stage metrics are better at predicting NPD demand than early-stage metrics	
7 (175)	Acur, N., Kandemir, D. and Boer, H. (2012)		A study of the effects of various internal and external factors association with NPD strategic alignment	
8 (176)	Jespersen, K.R. (2012)		A study on stage-to-stage information dependency in the NPD process	
9 (177)	Eggers, J.P. (2012)		Explores the contingent potential for learning from experience in NPD portfolio management	
10 (178)	McNAlly, R.C., Durmusoglu, S. and Calantone, R.J. (2013)		Study examines the antecedents and consequences of NPD portfolio management decisions by modeling manager dispositions, using organizational information processing theory	
	TOTALS	**3**	**7**	

Appendix F 1) Papers Selected For Full Review: Schedule of Journals and Year of Publication

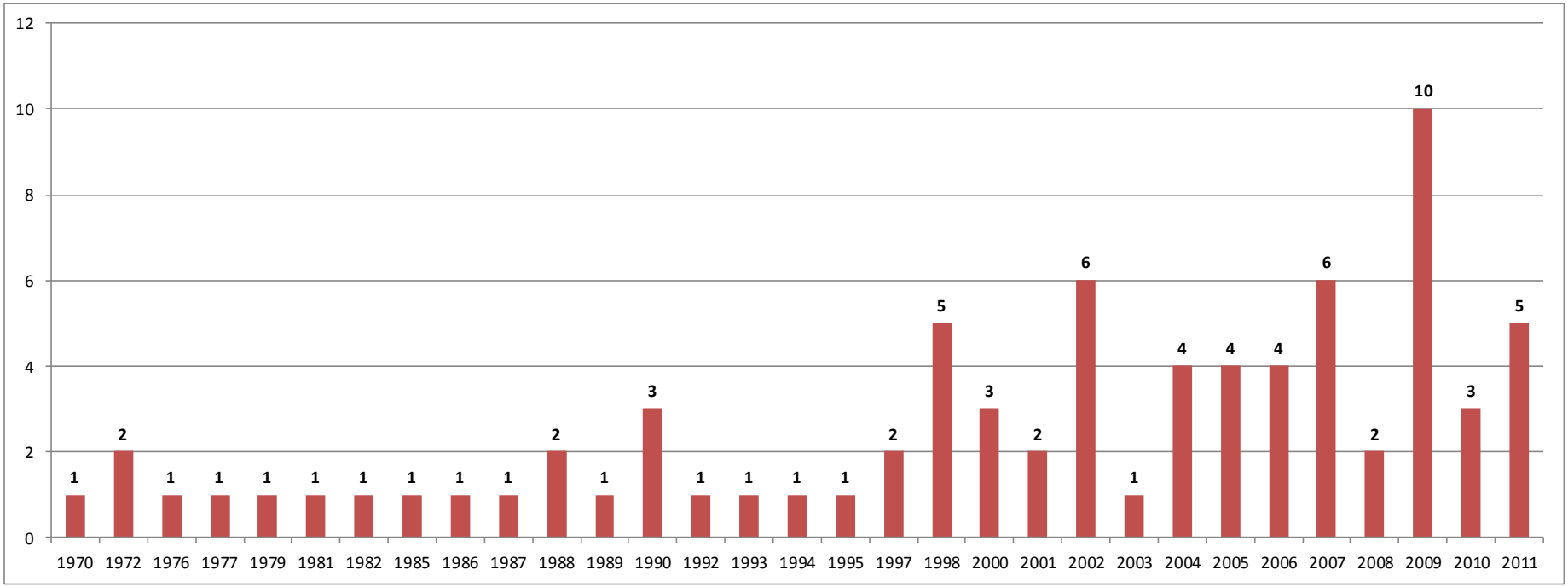
#			1	2	1	1	1	1	1	1	1	1	2	1	3	1	1	1	1	2	5	3	2	6	1	4	4	4	6	2	10	3	5	
		YEAR	1970	1972	1976	1977	1979	1981	1982	1985	1986	1987	1988	1989	1990	1992	1993	1994	1995	1997	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Totals
12	4*	Journal of Product Innovation Management																		1	1		1	2				1		1	3		2	12
7	3*	R & D Management					1								1		1							1		1			2					7
5	3*	Long range planning			1	1		1					1																			1		5
4	4*	Strategic Management Journal							1							1		1						1										4
4	4*	Accounting, Organizations & Society										1								1		1				1								4
4	3*	Research Technology Management																			1			1	1	1								4
2	4*	Journal of Marketing Research																	1				1											2
2	3*	Management Accounting Research																			1						1							2
2	2*	European Accounting Review																													2			2
2	1*	European Journal of Innovation Management																													2			2
2	3*	Industrial Marketing Management												1																	1			2
1	4*	Administrative Science Quarterly																			1													1
1	4*	Research Policy													1																			1
1	4*	Journal of the Academy of Marketing Science																						1										1
1	4*	Harvard Business review																										1						1
1	3*	Intl. Journal of Operations & Production Mgt.																														1		1
1	3*	Accounting Horizons																				1												1
1	3*	Behavioral Research in Accounting																											1					1
1	3*	European Journal of Marketing																										1						1
1	3*	International Journal of Forecasting									1																							1
1	3*	International Journal of Technology Management																			1													1
1	3*	Journal of Business Venturing								1																								1
1	3*	Technovation											1																					1
1	3*	Management International Review	1																															1
1	2*	International Journal of Innovation Management																													1			1
1	2*	European Business Review																				1												1
1	2*	Abacus		1																														1
1	2*	Journal of Management Accounting Research																													1			1
1	2*	Project Management Journal																											1					1
1	2*	International Journal of Project Management																															1	1
1	2*	Technology Analysis & Strategic Management																															1	1
1	1*	Business horizons		1																														1
1	1*	The Journal of Business & Industrial Marketing																									1							1
1	1*	The Journal of Product and Brand Management																									1							1
1	1*	International Journal of Quality and Reliablity Mgt																												1				1
1		Qualitative Research in Accounting & Management																															1	1
1		International Journal of Product Development																								1								1
1		Engineering Costs and Production Economics													1																			1
1		Journal of Fashion Marketing & Management																									1							1
1		Journal of International Management Studies																														1		1
1		Journal of Managerial Issues																										1						1
1		Australian Journal of Management																											1					1
1		Management Research News																											1					1
			1	2	1	1	1	1	1	1	1	1	2	1	3	1	1	1	1	2	5	3	2	6	1	4	4	4	6	2	10	3	5	78
78		% of Total	1%	3%	1%	1%	1%	1%	1%	1%	1%	1%	3%	1%	4%	1%	1%	1%	1%	3%	6%	4%	3%	8%	1%	5%	5%	5%	8%	3%	13%	4%	6%	

Appendix F 2) Schedule of Journals by Number of Articles Selected



Appendix F 3)

Papers Selected for Full Review: Schedule of Number of Articles by Year of Article Publication



APPENDIX G STAGE 6: Post Critical Review of Papers: MCS and NPD papers; key themes and factors and coding development

	KEY THEMES / FACTORS	PAPERS with the theme or factor	CODING
1	Feedforward control; Steering; Anticipatory control; Forecast value outcomes; Interactive control; Managing strategic uncertainty; Organizational learning; Brand strategy; Product innovation strategy	Koontz, H. and Bradspies, R. W. (1972); Ishikawa, A. and Smith, C. H. (1972); Radosevich, R. (1977); Nakahara, T., Matsuda, Y. and Motoyoshi, K. (1979); Miller, D., and Friesen, P. H. (1982); Kanter, R. (1985); Makridakis, S. (1986); Simons, R. (1987); Burton, R. M., Forsyth, J. D. and Melick, D. M. (1988); Kortge, G. D. and Okonkwo, P. A. (1989); Islei, G., Lockett, G. and Stratford, M. (1990); Simons, R. (1994); Moorman, C. (1995); Langfieldsmith, K. (1997); Karlsson, C. and Åhlström, P. (1997); Rice, M. P., O'Connor, G. C., Peters, L. S. and Morone, J. G. (1998); Nixon, B. (1998); Davila (2000); Henard, D. H. and Szymanski, D. M. (2001); Cooper, R. G., Edgett, S. J. and Kleinschmidt, E.J. (2002); Marginson, D. E. W. (2002); Bart, C. K. (2002); Cooper, R. G. and Edgett, S. J. (2003); Holmes, M. F. and Campbell, R. B.,Jr (2004); Helm, R., Scholl, A., Manthey, L. and Steiner, M. (2004); Godener, A. and Soderquist, K. E. (2004); Bisbe, J. and Otley, D. (2004); Saunders, J., Wong, V., Stagg, C. and Fontan, M. M. S. (2005); Ciappei, C. and Simoni, C. (2005); Pattikawa, L. H., Verwaal, E. and Commandeur, H. R. (2006); Kahn, K. B., Barczak, G. and Moss, R. (2006); Harmancioglu, N., Mcnally, R.C., Calantone, R.J. and Durmusoglu, S.S. (2007); Chiesa, V. and Frattini, F. (2007); Christiansen, J. K. and Varnes, C. (2008); Poskela, J. and Martinsuo, M. (2009); Paladino, A. (2009); Jørgensen, B. and Messner, M. (2009); Francis, M. (2009); Chiesa, V., Frattini, F., Lamberti, L. and Noci, G. (2009); Bisbe, J. and Malagueno, R. (2009); Micheli, P. and Manzoni, J. (2010); Barge-Gil, A., Nieto, M. J. and Santamaria, L. (2011); Martinsuo, M. and Poskela, J. (2011)	Feedforward anticipatory control
2	Escalation of commitment	Schmidt, J. B. and Calantone, R. J. (1998); Schmidt, J. B. and Calantone, R. J. (2002); Cooper, R. G. and Edgett, S. J. (2003)	Escalation of commitment
3	Stage gate decisions; go/no go; Evaluation, screening and review; Formal NPD process; Changing evaluation criteria at different NPD decision gates	Holt, K. (1970); Ramsey, J. E. (1981); Cooper, R. G. and Kleinschmidt, E. J. (1990); Karlsson, C. and Åhlström, P. (1997); Cooper, R. G., Edgett, S. J. and Kleinschmidt, E.J. (2002); Schmidt, J. B. and Calantone, R. J. (2002); Cooper, R. G. and Edgett, S. J. (2003); Godener, A. and Soderquist, K. E. (2004); Saunders, J., Wong, V., Stagg, C. and Fontan, M. M. S. (2005); Kahn, K. B., Barczak, G. and Moss, R. (2006); Harmancioglu, N., Mcnally, R.C., Calantone, R.J. and Durmusoglu, S.S. (2007); Jørgensen, B. and Messner, M. (2009); Christiansen and Varnes (2009); Martinsuo, M. and Poskela, J. (2011); Akroyd, C. and Maguire, W. (2011)	Stage-gate evaluation

	KEY THEMES / FACTORS	PAPERS with the theme or factor	CODING
4	Formal controls and creativity risk; Too high control, too low control; Tension between budgetary control and strategic renewal; "loose-tight" controls; Managerial control systems and NPD	Holt, K. (1970); Radosevich, R. (1977); Miller, D., and Friesen, P. H. (1982); Kanter, R. (1985); Cowen, S. S. and Middaugh, J. K.,II (1988); Bart, C. K. (1993); Simons, R. (1994); Langfieldsmith, K. (1997); Park, C. K. (1998); Kimura, S. and Mourdoukoutas, P. (2000); Davila (2000); Bisbe, J. and Otley, D. (2004); Frow, N., Marginson, D. and Ogden, S. (2005); Morris, M. H., Allen, J., Schindehutte, M. and Avila, R. (2006); Kanter (2006); Wynder, M. (2007); Harmancioglu, N., Mcnally, R.C., Calantone, R.J. and Durmusoglu, S.S. (2007); Revellino, S. and Mouritsen, J. (2009); Poskela, J. and Martinsuo, M. (2009); Richtnér, A. and Åhlström, P. (2010)	Control and creativity
5	A formal portfolio management process; Too many projects; Aggregation of product projects versus product level	Danneels, E. and Kleinschmidt, E. J. (2001); Cooper, R. G., Edgett, S. J. and Kleinschmidt, E.J. (2002); Cooper, R. G. and Edgett, S. J. (2003); Holmes, M. F. and Campbell, R. B.,Jr (2004); Godener, A. and Soderquist, K. E. (2004); Kahn, K. B., Barczak, G. and Moss, R. (2006); Francis, M. (2009); Mcnally, R.C., Durmusoglu, S.S., Calantone, R.J., and Harmancioglu, N. (2007); Christiansen, J. K. and Varnes, C. (2008); Kester, L., Griffin, A., Hultink, E.J. and Lauche, K. (2011)	Portfolio management
6	Aspiration levels; market performance feedback input	Greve, H. R. (1998)	Aspiration levels
7	Continuous and discontinuous innovation; Product innovativeness, radicalness, identifying strategic requirements	Rice, M. P., O'Connor, G. C., Peters, L. S. and Morone, J. G. (1998); Danneels, E. and Kleinschmidt, E. J. (2001); Francis, M. (2009); Chiesa, V., Frattini, F., Lamberti, L. and Noci, G. (2009)	Product innovativeness
8	Strategic typology (defender, prospector, analyzer, reactor)	Durmusoglu, S. S., McNally, R. C., Calantone, R. J. and Harmancioglu, N. (2008)	Strategic typology
9	Use of performance measures, challenges of measuring NPD performance	Cordero, R. (1990); Nixon, B. (1998); Hertenstein, J. H. and Platt, M. B. (2000); Marginson, D. E. W. (2002); Loch, C. H. and Tapper, U. A. S. (2002); Rogers, H., Ghauri, P. and Pawar, K. S. (2005); Kanter (2006); Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2007a); Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2007b); Chiesa, V. and Frattini, F. (2007); Francis, M. (2009); Chiesa, V., Frattini, F., Lazzarotti, V. and Manzini, R. (2009); Bisbe, J. and Malagueno, R. (2009); Micheli, P. and Manzoni, J. (2010); Fu, Y. (2010)	Use of PMS in NPD
10	Team participation in goal setting	Bonner, J. M., Ruekert, R. W. and Walker Jr., O. C. (2002); Poskela, J. and Martinsuo, M. (2009)	Participative goal setting

	KEY THEMES / FACTORS	PAPERS with the theme or factor	CODING
11	Upper management intervention; Controls that top management or senior management should be using to evaluate NPD	Taylor, B. (1976); Simons, R. (1994); Bonner, J. M., Ruekert, R. W. and Walker Jr., O. C. (2002); Harmancioglu, N., Mcnally, R.C., Calantone, R.J. and Durmusoglu, S.S. (2007); Durmusoglu, S. S., McNally, R. C., Calantone, R. J. and Harmancioglu, N. (2008); Poskela, J. and Martinsuo, M. (2009); Christiansen and Varnes (2009)	Top management control
12	Risk behaviour – framing the problem	Poskela, J. and Martinsuo, M. (2009)	Risk behaviour
13	Core capabilities and rigidities	Leonard-Barton, D. (1992); Bisbe, J. and Otley, D. (2004)	Core capabilities and rigidities
14	Boundary control	Simons, R. (1994); Micheli, P. and Manzoni, J. (2010); Artto, K., Kulvik, I., Poskela, J. and Turkulainen, V. (2011)	Boundary control
15	Domain relevant knowledge	Wynder, M. (2007)	Domain relevant knowledge
16	Research design challenges	Davila (2000); Danneels, E. and Kleinschmidt, E. J. (2001); Schmidt, J. B. and Calantone, R. J. (2002); Marginson, D. E. W. (2002); Bonner, J. M., Ruekert, R. W. and Walker Jr., O. C. (2002); Saunders, J., Wong, V., Stagg, C. and Fontan, M. M. S. (2005); Christiansen, J. K. and Varnes, C. (2008); Revellino, S. and Mouritsen, J. (2009); Chiesa, V., Frattini, F., Lamberti, L. and Noci, G. (2009); Richtnér, A. and Åhlström, P. (2010); Micheli, P. and Manzoni, J. (2010)	Research design
17	Reward systems	Simons, R. (1994)	Reward systems
18	Type of cost information effects on NPD	Davila (2000); Booker, D. M., Drake, A. R. and Heitger, D. L. (2007)	Cost information effects
19	Cognitive analytical capability	McNally, R., Durmusoglu, S., Calantone, R. and Harmancioglu, N. (2009)	Cognitive analytical capability

APPENDIX H Stage 5: Post Critical Reviews - Coding Saturation Schedule

Note: Papers ranked in descending Publication Year

Pub. Year	Codes	Feedf'd anticipatory control	Escalation of Commitment	Stage-gate evaluation	Control and creativity	Portfolio management	Aspiration levels	Product innovativeness	Strategic typology	Use of PMS in NPD	Participative goal setting	Top management control	Risk behaviour	Core capabilities & rigidities	Boundary control	Domain relevant knowledge	Research design	Reward systems	Cost information effects	Cognitive analytical capability	TOTALS
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTALS
	TOTALS	**43**	**3**	**15**	**19**	**10**	**1**	**4**	**1**	**15**	**2**	**7**	**1**	**2**	**3**	**1**	**11**	**1**	**2**	**1**	**142**
2011	Akroyd, C. and Maguire, W. (2011)			1																	**1**
2011	Martinsuo, M. and Poskela, J. (2011)	1		1																	**2**
2011	Kester L., et al. (2011)					1															**1**
2011	Artto, K., et. al. (2011)														1						**1**
2011	Barge-Gil, A., et. al. (2011)	1																			**1**
2010	Fu, Y. (2010)									1											**1**
2010	Micheli, P. and Manzoni, J. (2010)	1								1					1		1				**4**
2010	Richtnér, A. and Åhlström, P. (2010)				1												1				**2**
2009	Christiansen, J.K., and Varnes, C. (2009)			1								1									**2**
2009	McNally, R.C. et al. (2009)					1														1	**2**
2009	Bisbe, J. and Malagueno, R. (2009)	1								1											**2**
2009	Chiesa, V., Frattini, F., Lamberti, L. and Noci, G. (2009)	1						1									1				**3**
2009	Chiesa, V., et al. (2009)									1											**1**
2009	Francis, M. (2009)	1				1		1		1											**4**
2009	Jørgensen, B. and Messner, M. (2009)	1		1																	**2**
2009	Paladino, A. (2009)	1																			**1**
2009	Poskela, J. and Martinsuo, M. (2009)	1									1	1	1								**4**
2009	Revellino, S. and Mouritsen, J. (2009)				1												1				**2**
2008	Christiansen, J.K., and Varnes, C. (2008)	1				1											1				**3**
2008	Durmusoglu, S. S., et al. (2008)								1			1									**2**
2007	Harmancioglu, N, et al. (2007)	1		1	1							1									**4**
2007	Booker, D. M., Drake, A. R. and Heitger, D. L. (2007)																		1		**1**
2007	Chiesa, V. and Frattini, F. (2007)	1								1											**2**
2007	Chiesa, V., et al. (2007b)									1											**1**
2007	Chiesa, V., et al. (2007a)									1											**1**
2007	Wynder, M. (2007)				1											1					**2**
2006	Kanter, R. (2006)				1					1											**2**
2006	Kahn, K. B., Barczak, G. and Moss, R. (2006)	1		1		1															**3**
2006	Morris, M. H., et al. (2006)				1																**1**
2006	Pattikawa, L. H., et al.(2006)	1																			**1**
2005	Ciappei, C. and Simoni, C. (2005)	1																			**1**
2005	Frow, N., Marginson, D. and Ogden, S. (2005)				1																**1**
2005	Rogers, H., Ghauri, P. and Pawar, K. S. (2005)									1											**1**
2005	Saunders, J., et al. (2005)	1		1													1				**3**
2004	Bisbe, J., and Otley, D. (2004)	1			1									1							**3**
2004	Godener, A., and Soderquist, K.E. (2004)	1		1		1															**3**
2004	Helm, R., Scholl, A., Manthey, L. and Steiner, M. (2004)	1																			**1**
2004	Holmes, M. F. and Campbell, R. B.,Jr (2004)	1				1															**2**
2003	Cooper, R. G. and Edgett, S. J. (2003)	1	1	1		1															**4**
2002	Cooper, R. G., Edgett, S. J. and Kleinschmidt, E.J. (2002)	1		1		1															**3**
2002	Bart, C. K. (2002)	1																			**1**
2002	Bonner, J. M., et al. (2002)										1	1					1				**3**
2002	Loch, C. H. and Tapper, U. A. S. (2002)									1											**1**
2002	Marginson, D. E. W. (2002)	1								1							1				**3**
2002	Schmidt, J. B. and Calantone, R. J. (2002)		1	1													1				**3**
2001	Danneels, E. and Kleinschmidt, E. J. (2001)					1		1									1				**3**
2001	Henard, D. H. and Szymanski, D. M. (2001)	1																			**1**
2000	Davila, T. (2000)	1			1												1		1		**4**
2000	Hertenstein, J. H. and Platt, M. B. (2000)									1											**1**
2000	Kimura, S. and Mourdoukoutas, P. (2000)				1																**1**
1998	Greve, H. R. (1998)						1														**1**
1998	Nixon, B. (1998)	1								1											**2**
1998	Park, C. K. (1998)				1																**1**
1998	Rice, M. P., et al. (1998)	1						1													**2**
1998	Schmidt, J. B. and Calantone, R. J. (1998)		1																		**1**
1997	Karlsson, C. and Åhlström, P. (1997)	1		1																	**2**
1997	Langfield-Smith, K. (1997)	1			1																**2**
1995	Moorman, C. (1995)	1																			**1**
1994	Simons, R. (1994)	1			1							1			1			1			**5**
1993	Bart, C. K. (1993)				1																**1**
1992	Leonard-Barton, D. (1992)													1							**1**
1990	Cooper, R.G., and Kleinschmidt, E.J. (1990)			1																	**1**
1990	Cordero, R. (1990)									1											**1**
1990	Islei, G., Lockett, G. and Stratford, M. (1990)	1																			**1**
1989	Kortge, G. D. and Okonkwo, P. A. (1989)	1																			**1**
1988	Burton, R. M., Forsyth, J. D. and Melick, D. M. (1988)	1																			**1**
1988	Cowen, S. S. and Middaugh, J. K.,II (1988)				1																**1**
1987	Simons, R. (1987)	1																			**1**
1986	Makridakis, S. (1986)	1																			**1**
1985	Kanter, R. (1985)	1			1																**2**
1982	Miller and Friesen (1982)	1			1																**2**
1981	Ramsey, J. E. (1981)			1																	**1**
1979	Nakahara, T., Matsuda, Y. and Motoyoshi, K. (1979)	1																			**1**
1977	Radosevich, R. (1977)	1			1																**2**
1976	Taylor, B. (1976)											1									**1**
1972	Ishikawa, A. and Smith, C. H. (1972)	1																			**1**
1972	Koontz, H. and Bradspies, R. W. (1972)	1																			**1**
1970	Holt, K. (1970)			1	1																**2**
	TOTALS	**43**	**3**	**15**	**19**	**10**	**1**	**4**	**1**	**15**	**2**	**7**	**1**	**2**	**3**	**1**	**11**	**1**	**2**	**1**	**142**

Appendix I STAGE 6: Empirical studies of management controls and NPD with Feedforward Control Findings Identified From Full Paper Critical Review

EMPIRICAL PAPER	RESEARCH QUESTION	THEORY	METHODOLOGY	CONTEXT	KEY CLAIMS
Nakahara, Matsuda and Motoyoshi (1979)	How a profitability method is used to evaluate R&D projects?	N/A	Single company research. It appears that the authors worked in the R&D Group of Sumitomo Electric.	Japanese electronic and electronic systems at Sumitomo Electric Industries in the 1970s	1) Profit forecast information should always be readily available to project leaders 2) Profitability studies should analyze the effectiveness of past forecasts, with information on current forecasts and the analyzed data on past forecasts.
Miller and Friesen (1982)	The determinants of innovation in conservative and entrepreneurial firms.	N/A	Questionnaire survey.	52 Candian firms. Variety of industries. All respondents divisional VP or higher.	Analysis, “futurity” and consciousness of strategy formulation correlate positively in conservative firms and negatively in entrepreneurial firms.
Simons (1987)	The relationship between control system attributes and business strategies.	N/A	Interview informed questionnaire survey of pre-determined “prospector” or “defender” firms.	76 Ontario and Quebec based Canadian firms, from a wide variety of industries	High performing prospectors attach great importance to forecast data in control systems
Islei et al. (1990)	The paper discusses the impact of judgemental modelling using Multi Criteria Decision Making (MCDM) on resource allocation and strategic decision making in R&D departments of ICI.	N/A	Single company research. Longitudinal case study.	Pharmaceuticals and chemicals industry.	Success of the application process: determine the evaluation factors, develop an “attribute structure”, establish attribute weights to provide scoring benchmarks.
Simons (1994)	How and why new managers use formal control systems as a means of implementing strategy?	Levers of Control (LOC) framework	Study of 10 diverse USA firms, focusing on new top managers first 18 months in role. Longitudinal study. Interviews at 4 month intervals, plus secondary data.	USA firms, variety of industries; computing, banking, manufacturing, FMCG, utility and retail.	Four types of management controls; belief, boundary, diagnostic and interactive. Interactive controls are used to manage strategic uncertainties. Boundary controls are to avoid risks.

EMPIRICAL PAPER	RESEARCH QUESTION	THEORY	METHODOLOGY	CONTEXT	KEY CLAIMS
Moorman (1995)	Investigates the effects of organizational information processes on several new product outcomes.	Organizational market information processes	Survey questionnaire, 92 divisions of firms noted in the 1992 Advertising Age list of top 200 advertisers.	VPs of marketing used as informants.	Competitive advantage associated with information depends less on *availability* and more on *use* and these processes may act as "knowledge assets" to leverage competitive advantage in new products.
Karlsson and Ahlstrom (1997)	Guidance to top managers on how to manage the process of changing product development strategy.	N/A	Longitudinal action research single case study over 2.5 years. Used direct observation, interviews and document analysis.	An international manufacturing firm producing office equipment.	5 lessons on strategy development process including; strategic role of NPD, market versus marketing demand, goal achievement, present realities in strategic planning, cross-functional issue of NPD strategy.
Rice et al. (1998)	How evaluation and screening of NPD is conducted when uncertainty is highest.	N/A	Collaborative research project between Rensselaer Radical Innovation Research Project Team and Industrial Research Institute. In-depth interviews with key team members, for 11 projects with 9 firms, and 16 projects on IRI member companies, from a variety of industries.	Product has potential to be a "game changer". Firms; GE, TI, IBM, Nortel, Analog Devices, Du Pont, GM, OTIS, HP, Henkel, Colgate-Palmolive.	Incremental innovation and discontinuous innovation screening criteria, including; profit impact, rate of growth, return of new value.
Nixon (1998)	Factors that influence the choice and use of available R&D metrics in specific situations and explore the organizational context of R&D performance measurement.	Open-systems perspective	Single case study, semi-structured interviews, use of internal documents and publicly available information.	The firm case study is in the design and development of continuous casting machines for production of non-ferrous metals.	The nature of information and criteria changed during the process from the point of idea generation through to technological and commercial evaluation. Strategic orientation in the early "fuzzy front end".

EMPIRICAL PAPER	RESEARCH QUESTION	THEORY	METHODOLOGY	CONTEXT	KEY CLAIMS
Davila (2000)	How companies adapt their management controls to the particular characteristics of NPD.	The concept of uncertainty (Galbraith, 1973)	Case study development of a questionnaire survey. 5 managers interviewed in each case study, 12 business units, 7 companies, Europe and USA. Questionnaire survey; 11 companies, 56 respondents. Product development project the unit of analysis.	Medical devices industry; importance of product development process, technological diversity and diverse product strategies.	Managers use management controls in NPD to obtain information to reduce uncertainty. The alignment between the design and use of management controls and product strategy is significantly related to performance. management controls are a poor vehicle to reduce technology-related uncertainty. Negligible literature on management controls in product development.
Marginson (2002)	To generate ideas and propositions for further research in management controls and strategy formation.	Uses Simons LOC framework	An in-depth longitudinal case study. 26 semi-structured interviews, interviewed twice 12-15 months apart.	UK telecoms firm, 1300 people, $USD 4bn turnover.	A growing use of a range of management controls to control the strategy process; value systems, administrative controls and a range of KPIs.
Bart (2002)	How practicing managers are operationalizing their PICs.	N/A	Questionnaire survey, USA, managers and senior managers involved in NPD. Assessing the use of PIC components.	USA firms, “above industry average” for growth, “at industry average” profitability. Randomly selected from the PDMA.	3 PIC components have a comprehensive relationship with performance; statement of values, non-financial performance objectives and financial performance objectives.
Helm et al. (2004)	The use of preference measurement in early stages of NPD.	N/A	232 University students, questionnaires on a “selecting a university’ problem	Experiment with students.	Preference elicitation techniques allow the measurement of customer preferences in early development stages of NPD.
Godener and Soderquist (2004)	How internal R&D PMS are operated, main areas of use and impact.	N/A	3 firms, 12 interviews, open coding, axial coding.	France, electronics industry, all firms employing more than 15,000 people, 2 firms are multinational.	The formalization of the NPD process, integrating feed-forward performance measures may be “guaranteeing” the quality of the decision to launch or not.

EMPIRICAL PAPER	RESEARCH QUESTION	THEORY	METHODOLOGY	CONTEXT	KEY CLAIMS
Bisbe and Otley (2004)	To clarify through which specific relationships the link between interactive use of management controls and successful innovation as posited by Simons LOC framework is enacted.	Simons LOC framework	Questionnaire, 58 respondents, CEOs.	Catalonian, Spanish medium sized firms.	Interactive control systems may shape the rich emergence of patterns of action in high-innovating firms. Successful innovators use formal management controls interactively.
Saunders et al. (2005)	The changing nature of decision inputs at different evaluation points in the NPD process.	NPD process; stages and stage-gates	172 questionnaires, 314 new product projects.	Good mix of FMCG firms. Different functional roles in the different firms responded to the questionnaire.	Two significant gate evaluation criteria: compelling market size potential and lucrative market potential. Note: no knowledge of the performance outcomes.
Ciappei and Simoni (2005)	To understand the NPD process of sports shoe firms in the Montebelluna cluster.	N/A	Questionnaire survey and secondary data; websites, local chamber of commerce, major newspapares and specialized magazines. Sample of 20 firms, 90% selling product outside EU.	Manufacturers and distributors of sports shoes under their own brands. Mean annual sales €22m and average number of employees 74.	Significant discriminators of performance; team approach, customer orientation and technology. The customer orientation anticipates needs that will eventually be shared by the mass market.
Chiesa and Frattini (2007)	How the differences between 1) research and 2) development influence PMS design choices.	N/A	Multiple case study. 8 Italian technology-intensive firms. Used a theoretical framework to identify the fundamental elements of a PMS for R&D.	Italian technology-intensive firms; aerospace, cosmetics, machining, pharmaceuticals and chemicals.	Contribution to value seems to be a critical performance dimension for research PMSs.
Harmancioglu et al. (2007)	How SBUs tailor into their formal stage-gate processes; business case content, cross-functional integration and customer input.	N/A	3 case studies, collective case study method, 3 SBUs in the same conglomerate. 13 informants, face-to-face in-depth unstructured interviews.	USA building materials industry.	Industry competitive intensity is positively related to the use of a solid business case, customer input and feedback. Formalized procedures and documentation provide supervision to reduce uncertainty.

EMPIRICAL PAPER	RESEARCH QUESTION	THEORY	METHODOLOGY	CONTEXT	KEY CLAIMS
Christiansen and Varnes (2008)	To examine the behavior of decision makers in portfolio management meetings on innovation projects.	Appropriated decision making (Cyert and March, 1992)	Single case study. 18 semi-structured open-ended interviews with project managers, functional managers , several VPs and the portfolio manager. One of the researchers was an observer at two portfolio meetings.	Chemicals firm; polyolefin market leader (polyethylene and polypropylene).	The ambiguity of future preferences and outcomes of NPD positively increases flexibility in the decision maker's judgements for the potential of a project and in constructing various proposal calculations and values.
Poskela and Martinsuo (2009)	How are management control mechanisms associated with "front-end" NPD performance.	N/A	Cross-sectional questionnaire survey. 133 respondents, 1 per firm. Respondents base answers on their last completed front-end project.	All Finnish industrial companies with more than50 employees. Director level respondents.	The explorative nature of the front-end phase of NPD contributes to achieving a superior, validated product concept.
Paladino (2009)	To investigate the difference in innovative and financial outcomes between firms adopting high or low Market Orientation or Resource Orientation.	N/A	Questionnaire survey. 251 Australian executives. BU level of analysis. Variables; RO, MO, financial performance and innovation.	"Top" performing Australian manufacturing firms.	Need to develop synergistic bundles of resources providing source of uniqueness while simultaneously developing elements of MO to remain relevant. MO enables anticipation of customer latent needs.
Jorgensen and Messner (2009)	How the case organization uses different control mechanisms to balance efficiency and flexibility in NPD.	Enabling formalization (Adler and Borys, 1996; Adler et al. 1999)	Single company case , 16 months field study, working days within the business, interviews, archival data, formal and informal observation.	Division of a medium sized family owned Danish firm involved in control solutions for quality and processing of food and chemicals. 135 people in case R&D.	Use of feedback and feedforward control at stage-gates and during the stages of NPD.

EMPIRICAL PAPER	RESEARCH QUESTION	THEORY	METHODOLOGY	CONTEXT	KEY CLAIMS
Francis (2009)	To assess the commercial and operational performance of the Asda "Bullseye" private label food project on NPD process	N/A	Supplier association project team at Asda and 6 suppliers. Questionnaire.	UK food retailer private label NPD.	The most successful firms have improved planning and preparation at the "fuzzy front end" between formulation of concept and commitment to develop the product.
Chiesa et al. and Noci (2009)	To study the impact of innovation radicalness on management controls characteristics.	Uses Simons LOC framework.	Case study, multiple case study approach. 4 innovation projects, 2 per firm. 2 radical innovation projects, 2 incremental.	2 Italian firms in the home automation products industry.	The most innovative projects also require preliminary demand analysis and forecasting. Substantial reliance of interactive systems in the early stages of NPD.
Bisbe and Malagueno (2009)	The interactive use of MACS and the impact on NPD outcomes.	Uses Simons LOC framework.	Questionnaire; CEOs of 57 manufaturing firms.	Mature medium-sized (€18m - €180m) Catalonian Spanish manufacturing firms.	Interactive MACS have a focus on strategic uncertainties.
Barge-Gil et al. (2011)	To understand the sources of innovation in firms that develop innovations without performing R&D activities.	N/A	Uses the Spanish SBSS Ministry of Industry database. 6500 observations from 1300 firms, 1998-2002.	Spanish firms operating in all manufacturing industries.	Analyses of emerging technologies and anticipated trends and their implications for market opportunities become crucial with constantly changing markets, rapid innovation and reducing product lifecycles.
Martinsuo, M. and Poskela, J. (2011)	How the use of evaluation criteria is associated with innovation performance in the front end of innovation.	N/A	Questionnaire,107 usable responses, companies carrying out R&D. Level of analysis is a single project in the front end of innovation.	Companies from Finland with more than 50 employees.	Evaluation criteria are used to focus management attention and future business potential has a significant positive correlation with the use of strategic and technical criteria.

APPENDIX J Types of Feedforward Controls Identified – By Paper (43 papers)

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
Koontz, H. and Bradspies, R. W. (1972)	Theoretical	Describing the use of feedforward controls in cash planning, stock management and NPD. The authors present guidelines for the use of feedforward controls.	Preventing present and future deviations from plan. Deviations should be anticipated. Emphasis on input variables that lead to final results. Future directed controls. Undesired variations of inputs are fed into the input stream for correction or into the processes before outputs occur. Predicting the effects of inputs on outcome variables. Anticipatory feedback (Norbert Weiner)
Ishikawa, A. and Smith, C. H. (1972)	Theoretical	To define, describe and illustrate feedforward control. To suggest its application and to more clearly delineate the relationship between planning and control.	A form of anticipatory control. Continuous evaluation of the plan prior to actual performance. A forward flow of information regulated by a set point which permits anticipatory control. The control objective is to reduce the difference between planned and actual performance, before actual

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
			performance occurs. Preventative action is taken before the difference between planned and actual performance occurs.
Radosevich, R. (1977)	Theoretical	Examines the functions and attributes of organizational units to differentiate between traditional and new system design and processes that are more appropriate for innovative units.	Flexibility in formal systems to facilitate the accommodation of significant unanticipated events. Formal systems that explicitly recognize for the degree of risk and uncertainty. Control procedures provide a hierarchy of responses to deviations from plans.
Nakahara, T., Matsuda, Y. and Motoyoshi, K. (1979)	Empirical	How a profitability method is used to evaluate R&D projects?	Profit forecast information based on a profitability method. The method enables evaluation of forecast sales, income and break-even time. Future profitability modelling.
Miller and Friesen (1982)	Empirical	The determinants of innovation in conservative and entrepreneurial firms.	Analysis, futurity and consciousness of strategy formulation correlation with innovation. Carefully weighing alternative courses of action. Scanning and control systems warn executives of too much innovation. The greater the future-orientation the greater the

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
			concern with change and innovation. 'Scanning', gathering information from the environment and observing changes in customer desires, serves to bolster innovation.
Kanter, R. (1985)	Theoretical	Comparing entrepreneurial and administrative management for innovation and efficiency modes.	Long range plans and management priority setting can help focus local initiative so that more "drilled holes" produce yields (oil wells analogy)
Makridakis, S. (1986)	Theoretical	To assess and stimulate discussion on forecasting; its performance, evaluate its achievements, its shortcomings and how to improve relevance and usefulness.	Identifying and extrapolating established patterns or relationships in order to forecast.
Simons, R. (1987)	Empirical	The relationship between control system attributes and business strategies.	The importance given, by "prospector" firms, to forecast data in control systems, setting tight budget controls and careful monitoring of outputs.
Burton, R. M., Forsyth, J. D. and Melick, D. M. (1988)	Theoretical	The steering of a product family is contrasted with the managerial control function, with a focus on steering as a mode of managerial behaviour.	"Steering" is an approach and attitude to cope with continuing change. It goes beyond control to incorporate the need to constantly evaluate goals and activities. Steering is 'a managerial process that consists of planning, tracking, controlling, assessing and re-planning while simultaneously interacting with the environment on a continual basis'.

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
			The continual assessment and setting of goals. Proactively seeking goals which may be changing. Continually asking whether the established plan is the "right" plan in the face of change. A managerial perspective that reaches into the future.
Kortge, G. D. and Okonkwo, P. A. (1989)	Theoretical	To develop an integrated industrial product development lifecycle model to efficiently and effectively reduce product failure rates.	The integration and simultaneous development of the product and strategy development process.
Islei, G., Lockett, G. and Stratford, M. (1990)	Empirical	The paper discusses the impact of judgmental modelling (using Multi Criteria Decision Making (MCDM) on resource allocation and strategic decision making in R&D departments of ICI.	Develop an attribute structure for R&NPD project evaluation, with attribute weights and word models to provide benchmarks for a scoring procedure. Improves the transparency of decision-making and the communication of judgements and preferences.
Simons, R. (1994)	Empirical	How and why new managers use formal control systems as a means of implementing strategy?	Using the four LOC as an agenda for strategic renewal and initiatives.
Moorman, C. (1995)	Empirical	Investigates the effects of organizational information processes on several new product outcomes.	Information processes may act as 'knowledge assets' that can be leveraged to achieve competitive advantage in NPD.

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
Langfield-Smith, K. (1997)	Theoretical	To review and critique research studies of the relationship between management controls and strategy.	'Defender' firms that carry out little NPD are likely to have centralized control systems heavily reliant on feedforward control.
Karlsson, C. and Åhlström, P. (1997)	Empirical	Guidance to top managers on how to manage the process of changing product development strategy.	In the NPD 'funnel' it entails the generation and review of alternatives, the sequence of critical decisions and the nature of decision making.
Rice, M. P., et al. (1998)	Empirical	How evaluation and screening of NPD is conducted when uncertainty is highest.	Knowing the pursuit is worth the risk. Innovation screening criteria. A focus on the return of new value to the market. Clear articulation of strategic intent and the characteristics of potentially rich market domains.
Nixon, B. (1998)	Empirical	Factors that influence the choice and use of available R&D metrics in specific situations and explore the organizational context of R&D performance measurement.	R&NPD expenditure determined by assessment of market share and profit margin impact. Strategic management accounting concepts related to customer profitability, competitor analysis and investment appraisal.

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
Davila, T. (2000)	Empirical	How companies adapt their management controls to the particular characteristics of NPD.	NPD managers use management controls to obtain information needed to reduce uncertainty. MCS design and use is positively related to NPD performance.
Henard, D. H. and Szymanski, D. M. (2001)	Theoretical	A meta-analysis of the evidence on the determinants of new product performance.	Dominant drivers of NPD performance; market potential, predevelopment task proficiency and product meeting customer needs.
Marginson, D. E. W. (2002)	Empirical	To generate ideas and propositions for further research in management controls and strategy formation.	MCS used to control the strategy process; value systems used as mechanisms for strategic change and a range of KPIs.
Bart, C. K. (2002)	Empirical	How practicing managers are operationalizing their PICs.	PIC components with a comprehensive relationship to NPD performance; statement of values, non-financial performance objectives and financial performance objectives.
Cooper, R. G., Edgett, S. J. and Kleinschmidt, E.J. (2002)	Theoretical	Building more effective Go/Kill decision points and moving towards portfolio management.	Stage-gate “should meet” criteria; product advantage, market attractiveness and risk versus return.

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
Cooper, R. G. and Edgett, S. J. (2003)	Theoretical	Explores the problems around shortage of resources devoted to NPD and offers solutions.	Development of a product innovation strategy. Application of growth oriented metrics. Portfolio management solutions that evaluate, rank, prioritize and focus on fewer but better NPD projects. Tough rigorous gates with robust and visible go/kill criteria.
Holmes, M. F. and Campbell, R. B.,Jr (2004)	Theoretical	Presentation of a Product Development Business Process to improve business performance.	Strategic front end integrated questions; markets served, segments, size of opportunity, competitiveness of environment, key value propositions, expected outcome. Readiness stage-gate criteria; 'are you ready to proceed with confidence to the next stage?'
Helm, R., Scholl, A., Manthey, L. and Steiner, M. (2004)	Empirical	The use of preference measurement in early stages of NPD.	Preference elicitation techniques measured on customer preferences in early NPD to help predict market share and reduce risk of failure.
Godener, A., and Soderquist, K.E. (2004)	Empirical	How internal R&D PMS are operated, main areas of use and impact.	Feedforward metrics set up before NPD project launch covering project feasibility and risks including; customer needs identification, expected profitability of the outputs, portfolio analyses and competitive strategy benchmarks. The formalization of the R&NPD process with integration of feedforward performance measures may be considered as 'guaranteeing' the quality of decision to launch or not.

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
Bisbe, J., and Otley, D. (2004)	Empirical	To clarify through which specific relationships the link between interactive use of management controls and successful innovation as posited by Simons LOC framework is enacted.	Interactive control systems may provide the basis for selecting those initiatives that maximize the impact on performance. Direction provided by interactive control systems is an aspect of focus where “filtering” can curb excessive and superfluous innovation.
Saunders, J., et al. (2005)	Empirical	The changing nature of decision inputs at different evaluation points in the NPD process.	Two significant NPD evaluation criteria; compelling market size potential and lucrative market potential. Lucrative market potential has a role throughout all the NPD stage-gate evaluations.
Ciappei, C. and Simoni, C. (2005)	Empirical	To understand the NPD process of sports shoe firms in the Montebelluna cluster.	A key NPD success factor is customer orientation, anticipating needs eventually shared by the mass market. This requires developing close relationships with customers to be ready to catch early and weak signs of emerging needs and trends.
Pattikawa, L. H., et al.(2006)	Theoretical	An attempt to synthesize extant new product performance research at the project level.	In understanding NPD performance determinant variables, the two largest effect sizes are 1) R&D and Marketing integration and 2) organizational interaction.
Kahn, K. B., Barczak, G. and Moss, R. (2006)	Theoretical	Presents a view of a best practices framework of NPD management, by organizing benchmarking data from published studies.	General themes for NPD best practice include; long-term strategic orientation, formal portfolio management that screens out product concepts, highly visible formal stage-gate strategic emphasis go/kill criteria and proactive market research that anticipates future customer needs.

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
Chiesa, V. and Frattini, F. (2007)	Empirical	How the differences between 1) research and 2) development influence PMS design choices.	Contribution to value seems to be a critical performance dimension for research PMS.
Harmancioglu, N, et al. (2007)	Empirical	How SBUs tailor into their formal stage-gate processes; business case content, cross-functional integration and customer input.	Industry competitive intensity is positively related to the use of a solid business case, customer input and customer feedback.
Christiansen, J.K., and Varnes, C. (2008)	Empirical	To examine the behaviour of decision makers in portfolio management meetings on innovation projects.	Flexibility in judgement in NPD decision-making is positively related to the construction of future value calculation analyses.
Poskela, J. and Martinsuo, M. (2009)	Empirical	How are management control mechanisms associated with "front-end" NPD performance.	In the explorative front end of innovation specific and challenging goals lead to higher performance. Strategic vision may entail value-laden choices of what is right for the firm and reduces different interpretations of expected outcomes and increases goal consensus.
Paladino, A. (2009)	Empirical	To investigate the difference in innovative and financial outcomes between firms adopting high or low Market Orientation or Resource Orientation.	MO may enable companies to anticipate latent customer needs and ensure that market relevance remains. MO can be referred to as a strategy.
Jørgensen, B. and Messner, M. (2009)	Empirical	How the case organization uses different control mechanisms to balance efficiency and flexibility in NPD.	The stage-gate model establishes a difference between control at the gates (feedback control) and control during the stages (feedforward control). Case stage-gate criteria of using a payback ratio calculated as the sum of expected contribution margin over five years, divided by the development costs.

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
Francis, M. (2009)	Empirical	To assess the commercial and operational performance of the Asda “Bullseye” private label food project on NPD process.	The most successful firms take longer in planning and preparation activities, conducting appropriate “front-end homework” in the form of market, technical and financial assessment.
Chiesa, V., Frattini, F., Lamberti, L. and Noci, G. (2009)	Empirical	To study the impact of innovation radicalness on management controls characteristics.	Innovative product projects require a preliminary demand analysis and forecasting. In the case companies there is a great reliance on interactive control systems, for radical type NPD, in the early stages.
Bisbe, J. and Malagueno, R. (2009)	Empirical	The interactive use of MACS and the impact on NPD outcomes.	Interactive MACS have a focus on strategic uncertainties. A key innovation mode attribute is the existence of mechanisms for evaluating trade-offs among product projects.
Micheli, P. and Manzoni, J. (2010)	Theoretical	Argument that the design of an SPMS and the definition of its roles are fundamental factors determining its success and impact on business performance.	SPM play an active role in the introduction of change initiatives and innovation strategies. Balancing financial and non-financial indicators, or lagging and leading indicators, can generate both feedback and feedforward loops. SPM can be used to gather past performance data but also implement strategic objectives.
Barge-Gil, A., et. al. (2011)	Empirical	To understand the sources of innovation, in firms that develop innovations, without performing R&D activities.	Technology forecasting, anticipation of trends and implications for market opportunities is an important part of innovation strategy and enhances innovation performance.

Papers researching management controls and innovation	Theoretical or Empirical Study	Research Question	Operationalized or theoretical type of feedforward controls identified or claimed
Martinsuo, M. and Poskela, J. (2011)	Empirical	How the use of evaluation criteria is associated with innovation performance in the front end of innovation.	Attention focused on the strategic opportunity in terms of future business potential as anticipated by NPD managers

APPENDIX K Project 2 Protocols

1) General Aspects to be Captured:

- Where thoughts are now
- What is happening now, what people think
- the creation and weighing up of options
- Use of boundaries and judgement.

Capture where the data comes from: observation, interviews, questionnaires, documentation.

2) Range Review Meetings Protocol

For observation of the stage-gate product range review meetings the context, process and content framework protocol was used (Pettigrew et al., 1989).

CONTEXT

Number of markets, size of the business, brand maturity, head office location, leadership (management style, culture, how meetings are run), individual maturity, team maturity (reflective learners?), what comes out of the meeting and goes into the process, macroeconomic, industry, trends, sources of data – industry reports (does not have to be published).

PROCESS

What do they currently do, what are they actually doing:

- How do they do the evaluation?
- How do they go through the stage-gates?
- Disciplines?

Set-up update interviews, post the review meetings.

What have I observed? Is that feedback? Is that feedforward?

- Capture the feedback and feedforward metrics used throughout the process
- Identify any metrics being used in the stage-gate meetings to inform decision-making
- Identify how they are being used to inform decision-making
- At what part of the process they are used
- The level of formality in the review meeting
- Is there any comparison against target or aspiration?
- Whether any metrics are used to challenge escalation of commitment.

Post review meetings

- Sit down and replay everything that happened in the meeting and note it down
- Use prompts from documents and recording
- Transcribe where relevant.

CONTENT
Capture peoples impressions of FAC, how they perceive it.

What comes out of the range build decision-making:

- Go/no-go and change/kill
- Performance management and management controls used
- Performance of the range.

3) Semi-structured interviews protocol

How are you anticipating performance in product decision-making?
At the stage-gate meeting you said "*xxxx*" when anticipating performance outcomes, what were you thinking at that point?
What are you considering when you make the product decisions?
Where is decision-making difficult in the review meeting?
What would have helped make the decision-making easier?
What information helps?
What additional information not available would have helped?

4) Focus Groups Protocol

Two questions were asked in the focus groups;

1) In range planning and build, what works well?
2) What does not work well?

5) Additional semi-structured interviews – "External" brands

The following protocol was used:

Which company did you work for?
What was the total sales turnover?
How many countries was the brand sold in?
How many employees in the company?
How long did you work for that company?
What was your last role in the company?
Did you sit in range review meetings?
Who participated in the meeting?
What information was used to make product decisions?
When would a decision on product be difficult?
Was there any other information that helped in the decision-making?
Was any forecast information used, like volume forecasts?
In hindsight would there have been any additional information that would have been useful?
Did you look at SCO productivity?

APPENDIX L Roles Present in Range Review Meetings and Focus Groups, and Roles of Interview Informants

APPENDIX L i) Range Reviews – Roles present

Brand	Job Title
Sport-Two	Product Director Design Manager Designers (x4) Category Researcher Category Manager Senior Developer (x2) Assistant Footwear Developer
Walk-One	Global VP Product and Marketing Product Development Manager Business Analyst Product Manager Category Manager Product Manager Costing Analyst (x 2) EU regional Sales Manager Merchandising Manger
Foot-One	Managing Director Category Manager Mens Footwear Designer Womens Footwear Designer Freelance Designer Supply Chain Manager Head of Marketing Finance Manager eCommerce Manager

Brand	Job Title
Foot-Two	Managing Director Finance Director Category Manager Finance Manager Operations Manager Assistant Operations Manager Sales Manager Marketing Manager Designers (x2) Product Assistant
Fashion-Three	Managing Director Design Manager Head of Marketing Head of Sales Designers (x2) Design Manager Sales and Account Manager Visual Merchandiser Account Manager Sales Manager Financial Controller Technical Manager UK Sales Manager Key Account Manager Marketing and PR Executive

APPENDIX L Roles Present in Range Review Meetings and Focus Groups, and Roles of Interview Informants

APPENDIX L ii) Interview informants

Brand	Job Title
Sport-One	Supply Chain Team Leader Category Manager
Sport-Two	Business Analyst Product Director Global Head of E-Commerce E-commerce Marketing Manager E-commerce merchandiser (x2) Commercial Financial Controller International Management Accountant
Walk-One	Global VP Product and Marketing Category Manager (x3) Merchandising Manager EU Regional Sales Manager
Foot-One	Footwear Category Manager
Fashion-One	Managing Director
Fashion-Two	Managing Director Finance Director Sales Director Product Director
Fashion-Three	Managing Director Head of Sales Head of Supply Chain Design Manager

APPENDIX L Roles Present in Range Review Meetings and Focus Groups, and Roles of Interview Informants

APPENDIX L iii) Focus Groups – roles present

Brand	Job Title
Sport-One	Vice President of Product and Marketing Chief Operating Officer Head of Finance Head of Category Strategy and Planning Supply Chain Manager Head of E-Commerce Category Manager - Licensing Head of Corporate Responsibility Supply Chain Team Leader VP of Human Resources E-Commerce Manager Cost and Price Accountant E-Commerce Merchandise Manager
Walk-One	Designer Head of UK Sales and Retail Online Trading Manager Sales Executive Product Assistant Product Development Retail Merchandiser Sales Director - EMEA Retail Merchandiser Business Analyst
Fashion-Two	Managing Director Sales Director Finance Director Product Manager Footwear Footwear Designer Women's Footwear Designer Design / Product Developer Footwear Apparel Product Manager Senior Apparel Designer Menswear Designer Apparel Designer Senior Technical Product Developer Garment Technologist Finance Manager

APPENDIX M

Industry Specific Role Descriptions

Product Director
A Product Director typically has responsibility for the design and development of a number of product categories.

Category Manager / Product Manager / Merchandising
The Category Manager has overall responsibility for a particular category performance and for co-ordinating and leading the development and build of the product range for that category.

Designer
The Designer comes up with the product concepts and usually develops these ideas through sketches, line drawings and CAD drawings.

Developer
A product developer converts the style CAD drawing into a product specification that a third party manufacturer can use to produce a physical prototype. The developer is also involved in product ex-factory costing, construction and materials selection.

Business Analyst
The analysis carried out in this role covers a broad spread of information but typically reviews actual performance in the various dimensions of product and sales distribution categorization. The role is also involved in analysing forecasts and planned performance.

Costing Analyst / Cost and Price Accountant
The costing and price accountant is responsible for monitoring margin performance, typically % margin performance. The role can also involve working with Developers to review construction and materials for cost reduction options.

Visual Merchandiser
A visual merchandiser works in third party retailer stores to help merchandise product at point-of-sale.

Supply Chain Team Leader
The core role of the Supply Chain Team Leader is to manage category and product forecasts from market requirements through to vendor factory capacity planning.

APPENDIX N Transcript Labels Page 1

Jo M - Foot-One
Feedback info

Focus

Identify gaps

Avoid duplication

Product role

Price architecture

Margin

Confidence

Design creativity

Walk-One – Focus group
Good hit rate

Consumer driven range build

Subjective decision-making

Pricing [discipline]

Constructing clear stories

Too reactive to the market

Hitting MOQs

Too many styles

Overlap between categories

Focus

Planning in flexibility

Upstream planning

Richard R – Fashion-One
Range plan disciplines

Designing to a price point and and a cost

SCO place justification

Brand and product characteristics

Not throwing too much at the wall

Price points and curve

Margin

Target cost

Market proposition

David H – Walk-One
Risk being managed

Price right

Knowing the customer for the product

Development speed

Margin

Richard P - Walk-One
Duplication

Cannibalization

Range size

Forecasting capability

Product range justification

Control in review meetings

Problems acknowledged by Product / Category Management

Alignment - goals

Market / consumer understand the new product

Mike C - Walk-One
Alignment

Up-front

Margin

Price / margin / volume understanding elasticity

SCO investment sense check (justification)

Identify retailer sweet spots

Price points and curve

Managing emotion

Having enough info to make a decision

Commercial and product led

Greater Focus

Range size

Less overdevelopment

APPENDIX N Transcript Labels Page 2

Sport-One – Focus Group	Lisa R - Walk-One	Seb W – Walk-One	Walk-One – Review Meeting
Good info going in	Alignment – joined up at the big picture	Alignment	Cash margin
Responsive to feedback data	Sales backing		Quality of forecasting
We can create trends	Confidence in the forecasts		Cannibalization
Unnecessary complexity	Up-front SCO plans agreed early		[Discipline]
Duplication			Understanding product risk Price points
Seeing the full picture – in time to react			Duplication
Early identification of non-commercial product			Stories
			Managing margin expectations

APPENDIX N Transcript Labels Page 3

Roger S – Fashion-Three	Amanda S – Fashion3 /Foot-One	John W – Fashion-Three	Matt R – Fashion3 / Foot-One
Deliver for retail	Formal planning / formality in range planning	Product on brand	Range size and SCO count
Find and fill the gaps	Responsibilities and timelines	Customer and commerciality	Range categorization
Ideal SCO target/Target SCO count	[discipline]	Balance of the range; category splits,	Insight and trend driven into range
Managed overdevelopment	Alignment	no duplication	planning
Duplication	Range balance – Margin	MOQs [for unknown styles]	Up-front work
Recognising the trend patterns	Price curve	Divide sales	Overdevelopment
Recognising new categories coming through	Confidence	Conversion hit rate (launch to production)	Capacity planning with vendors
Recognising changing trends between categories	Target SCO count	Product looking good	Vendor relationships
Market prices	Conversion hit rates	Achieving a performing core and bring in newness	Conversion hit rate
Price positioning	Average order size by vendor	Seeing trends coming through	Splitting sales / duplication
	MOQs	Forecasting / Futurity	Margin / Cash margin
			Supply chain KPIs / metrics

Briefing to a price point	SCO productivity / range size efficiency	Meets consumer requirements	Alignment [cross-functional]
Not missing anything special (How do you know?)	Vendor relationships	Less personal opinions / just feelings	Core product replacement
Establish handwriting (GH – Visual Language?)	Quality of forecasting		Clarity on categories
	Delivery performance		Price points
Replacing best sellers that have cooled-off	Vendor capacity planning		More informed decision-making
Conviction and confidence	Managing the supply risk		Framework / portfolio management
Vendor selection and capacity planning	Escalation of commitment		
Focus and clarity	Objective decision making		

APPENDIX N Transcript Labels Page 4

Fashion-Three – Review Meeting	Gareth H – Sport-Two	Mgt Group Fashion-Two	John R – Sport-One	Focus Group – Fashion-Two
Overall SCO count	SCO productivity	Range size	Bias in forecasting	Margin
Conversion rate	Focus	Acknowledging problems	Forecast at SCO level	Able to set trends
Range size	Futurity	Identifying winners	Substance behind decision-making	Having unique styles
Managing uncertainty	Range size	Planning	Forecast quality and timing	Critical path management discipline
Duplication	Conviction	Newness / Carryovers	Level of carryover and ease of forecasting	Realistic development capability
Price – commerciality	Intuition	Price architecture & price points		Core product is understood
Core product replacement	Forecasting through NPD	Margin	Belief in the forecast	Carryover styles are managed
On trend product	SCO justification	Clarity	Using feedback data	Clearer “kill” decisions
Forecast demand	Find the winners	Alignment	Forecast sense check	“Killing” early
Cannibalization	Replace things getting old	Framework	Accountability for the forecast	Flexibility to fill gaps

			Trends	
MOQs	Cash margin	Target SCO count		Formality of controls - guidelines
			Market insight	
Price elasticity	Allow for creative space	Objective decision-making		Strategic planning capability
			Forecasting category growth or	
	Quality of forecasting	Conviction	Decline	SCO productivity target
	Visual language	Nothing important missing	Forecast focus on uncertainty /	Up-front information
			new products	
		Confidence		Feedback information
			Understanding the benefits of more	
		Trends	accurate forecasts	Greater full-price sell-through at retail
		Having solid information	Up-front	Range size too large
				Price points and architecture

APPENDIX N Transcript Labels Page 5

Marc A – Sport-Two	**Sport-Two E-commerce group**	**Ashley A – Sport-One**	**Foot-Two – Review Meeting**
SCO productivity	SCO productivity and SCO tail	Category planning and projections	Big opportunities
Forecasting at SCO level	Having stock of key styles	Newness versus steady state, core	Incremental business
Capacity planning	Focus – targeting the buy	Gross margin targeting	SCO productivity
Planning and demand management	Quality of the forecast	Winners and losers, discontinuations, gaps	Competitor price levels
Margin protection	Understanding category & gender splits	SCO bottom-up planning and top-line	Refreshing core product
Up-front planning	Quality of analysis & decision-making	category	Two styles doing the same job
Planning and forecasting	Feedback information	Forecast at SCO level during development	Development resource and factory volumes
Conversion hit rate	Size of the range (e-commerce context)		**Foot-One – Review Meeting**
Alignment	Trends and trend forecasting		Price point gaps

Feedback data	Right price	**Sport-Two – Review Meeting**	Experimenting on existing kits
SCO justification	Price elasticity	Managing emotion, it's not personal	Covering relevant looks
Range size	Product differentiation	SCO productivity	Introducing new categories
Identifying trends & market opportunities	Selecting core volume colours	Number of SCOs needed	Developing new styles
	Splitting sales	Development resource alignment	Successful new categories
	Conviction	Avoiding duplication	Too many SCOs
	Not missing opportunities	Achieving MOQs	Duplication
	Category managers acknowledging what doesn't work in NPD	Planning options for growth	A lot of product in a tight range
		Finding winners	

APPENDIX N Transcript Labels Page 6 – "External" Brands

E Fashion Brand A	E Sport Brand B	E Sport Brand C
Conversion hit rates	Global consistency	Briefing days and briefing packs
Reactionary	SKU efficiency	% Margin
SCO productivity	Product lifecycle	Good, better, best pricing
Margin	% Margin	Compromising creativity
Subjective decision-making	Margin visibility	
Forecast alignment	Category target margins	
Emotion	Emotion	
Relevant product	Price architecture	
	Product newness	
	Volume, sales and margin	

APPENDIX O Performance Measures Categorization (by Brand and Research Methodology)

i) RANGE STRUCTURE PERFORMANCE

BRAND	Range Review Meeting	Interview	Focus Group
Sport-One		Category planning and projections SCO bottom-up planning and top-line category Forecast at SCO level during development	Unnecessary complexity Duplication Range too large
Sport-Two	Number of SCOs needed Avoiding duplication Achieving MOQs	SCO justification Range size Focus – targeting the buy Size of the range (e-commerce context) Splitting sales Understanding category and gender splits Selecting core volume colours Focus	
Walk-One	Cannibalization Understanding product risk Duplication	Risks being managed Duplication Cannibalization Range size Product range justification SCO investment sense check Greater focus Range size Less overdevelopment	Hitting MOQs Too many styles Overlap between categories Focus
Foot-One	Experimenting on existing kits Too many SCOs A lot of product in a tight range Duplication	Focus Avoid duplication Product role	

BRAND	Range Review Meeting	Interview	Focus Group
Foot-Two	Two styles doing the same job		
Fashion-One		SCO place justification Not throwing too much at the wall	
Fashion-Two		Range size Newness / carryovers Framework Clarity	Core product is understood Carryover styles are managed Range size too large Realistic development capability
Fashion-Three	Overall SCO count Range size Managing uncertainty Duplication Cannibalization MOQs	Find and fill the gaps Ideal SCO target Managed overdevelopment Duplication Focus and clarity Target SCO count MOQs, and for unknown styles Balance of the range; Products category splits, no duplication Divide sales / splitting sales Range size and SCO count Range categorization / clarity on categories Overdevelopment Framework / portfolio management	

APPENDIX O Performance Measures Categorization (by Brand and Research Methodology)

ii) PRICE ARCHITECTURE PERFORMANCE

BRAND	Range Review Meeting	Interview	Focus Group
Sport-One			
Sport-Two		Right price Price elasticity managed	
Walk-One	Price points	Price is right Price / margin / volume understanding elasticity Price points and curve	Pricing [discipline]
Foot-One	Price point gaps	Price architecture Price curve	
Foot-Two	Competitor price levels		
Fashion-One		Designing to a price point and a cost Price points and curve	
Fashion-Two		Price architecture and price points	Price points and architecture
Fashion-Three	Price – commerciality Price elasticity	Market prices Price positioning Briefing to a price point Price point	

APPENDIX O Performance Measures Categorization (by Brand and Research Methodology)

iii) DESIGN PERFORMANCE

BRAND	Range Review Meeting	Interview	Focus Group
Sport-One		Trends Newness versus steady-state/core Winners and losers, discontinuations, gaps	We can create trends
Sport-Two	Planning options for growth Finding winners	Identifying trends and market opportunities Product differentiation Not missing opportunities Find the winners Replace things getting old Allow for creative space Visual language on the product	
Walk-One	Stories	Knowing the customer for the product Market/consumer understand the new product Identify retailer sweet spots Commercial and product led	Consumer driven range build Constructing clear stories
Foot-One	Covering relevant looks Introducing new categories Designing new styles	Design creativity	
Foot-Two	New categories Big opportunities Incremental business Refreshing core product		
Fashion-One		Brand and product characteristics Market proposition	

BRAND	Range Review Meeting	Interview	Focus Group
Fashion-Two		Identifying winners Nothing important missing Trends	Having unique styles Flexibility to fill gaps Able to set trends Greater full-price sell-through at retail
Fashion-Three	Core product replacement On trend product	Deliver for retail Recognising the trend patterns, Recognising new categories coming through Recognising changing (volume) trends between categories Not missing anything special Establishing handwriting Replacing best-sellers that have cooled-off Product on brand Customer and commerciality Product looking good Achieving a performing core and bring in newness Seeing trends coming through Meets consumer requirements Insight and trend driven into range planning Core product replacement	

APPENDIX O Performance Measures Categorization (by Brand and Research Methodology)

iv) METRICS

BRAND	Range Review Meeting	Interview	Focus Group
Sport-One			
Sport-Two	SCO productivity	SCO productivity and SCO tail Conversion hit rate Margin protection Having stock of key styles Cash margin	
Walk-One	Cash margin Managing margin expectations	Margin Development speed	Good (conversion) hit rate
Foot-One			
Foot-Two	SCO productivity		
Fashion-One		Margin	
Fashion-Two		Target SCO count Margin	Margin SCO productivity target
Fashion-Three	Conversion rate	Conversion hit rates; prototype to launch, launch to production Average order size by vendor SCO productivity / range size efficiency Delivery performance Margin / Cash margin Supply chain KPIs / metrics	

APPENDIX O Performance Measures Categorization (by Brand and Research Methodology)

v) UP-FRONT PLANNING PERFORMANCE

BRAND	Range Review Meeting	Interview	Focus Group
Sport-One		Bias in forecasting Forecast at SCO level Forecast quality and timing Level of carryover and ease of forecasting Belief in the forecast Forecast sense check Accountability for the forecast Forecasting category growth or decline Forecast focus on uncertainty, new products Understanding the benefits of more accurate forecasts Up-front	Seeing the full picture, in time to react Early identification of non-commercial product
Sport-Two		Forecasting at SCO level Capacity planning Planning and demand management Up-front planning Planning and forecasting Quality of the forecast Trends and trend forecasting Futurity Forecasting through NPD	
Walk-One	Quality of forecasting	Confidence in the forecasts Up-front SCO plans agreed early Up-front Forecasting capability	Too reactive to the market Planning in flexibility Upstream planning

BRAND	Range Review Meeting	Interview	Focus Group
Foot-One			
Foot-Two			
Fashion-One			
Fashion-Two		Planning	Up-front information Strategic planning capability
Fashion-Three	Forecast demand	Formal planning, formality in range planning Up-front work Quality of forecasting Forecasting / ‘futurity’	

APPENDIX O Performance Measures Categorization (by Brand and Research Methodology)

vi) OBJECTIVE INFORMED DECISION-MAKING

BRAND	Range Review Meeting	Interview	Focus Group
Sport-One	Good info going in Responsive to feedback data	Substance behind decision-making Using feedback data Market insight	
Sport-Two	Managing emotion, "it's not personal"	Use of feedback data Feedback information Conviction Category managers acknowledging what doesn't work in NPD Conviction and intuition	
Walk-One		Control in review meetings Problems acknowledged by Product/Category management Managing emotion Having enough information to make a decision	(Too much) Subjective decision-making
Foot-One		Feedback info	
Foot-Two			
Fashion-One			
Fashion-Two		Objective decision-making Conviction Confidence Having solid information	Feedback information Clearer "kill" decisions Formality of controls - guidelines "Killing" early
Fashion-Three	Managing uncertainty	Conviction and confidence Objective decision-making Escalation of commitment Less personal opinions or 'just feelings' More informed decision-making	

APPENDIX O Performance Measures Categorization (by Brand and Research Methodology)

vii) CROSS-FUNCTIONAL ALIGNMENT

BRAND	Range Review Meeting	Interview	Focus Group
Sport-One			
Sport-Two	Development resource alignment	Alignment	
Walk-One		Alignment – joined up at the big picture Sales backing Alignment Alignment – goals	
Foot-One			
Foot-Two	Levels of development resource and balancing of factory volumes		
Fashion-One			
Fashion-Two		Alignment	
Fashion-Three		Vendor selection and capacity planning Responsibilities and timelines (discipline) Alignment Range balance (across different requirements) - margin Vendor relationships and capacity planning Managing the supply risk Cross-functional alignment	

APPENDIX P Review Meetings: Cross-Case Analysis

BRAND	Range Review Meeting Stage	No. of Partic-pants	Total Meeting Time	Number of SCOs Reviewed	SCOs Per Hour Reviewed	Meeting – General aspects and process observations
Sport-Two	"Line Review" Physical samples	11	2 hours 0 mins	144	72	The meeting was strongly led by the Product Director; following the agenda, keeping the pace and getting decisions made. There was a continuous review against the line plan by the Senior Developer. The range balance and alignment issues were already understood by participants, before the meeting had started. SCO productivity was periodically discussed.
Walk-One	"2nd Proto Review" Physical samples	Up to 22	6 hours 30 mins	40	6	It was an open discussion, with comments freely given. Views were openly shared and discussed, especially on product characteristics. The final or key decisions are predominantly made by the Category Managers or the VP of Product and Marketing. There was a lot of focus on price points and margin and substantial discussion on product "fit" and shaping. For about one in every three products there was a prolonged discussion on evaluating the change options for product characteristics. There was no regular standing back in the meeting to review the decisions against "big picture" targets, nor any overall commercial value sense-check. There was no "up-front picture review". SCO productivity or thresholds were not discussed.
Foot-One	"100% CAD review" CAD drawings	9	2 hours 15 mins	144	64	There was no use or discussion at all on volumes or forecast volumes. There was a lot of discussion about materials, "trims", aesthetics and market positioning. There was a small number of discussions on "target margin %". There was no commercial value sense-checks or SCO productivity considerations.

BRAND	Range Review Meeting Stage	No. of Partic-pants	Total Meeting Time	Number of SCOs Reviewed	SCOs Per Hour Reviewed	Meeting – General aspects and process observations
Foot-Two	"Review meeting 1" Physical samples	11	5 hours 25 mins	49	9	The difficult issues were opened up to the meeting. The views from all the individuals and functions represented were sought. There were two core products that took up 75 minutes of discussion. There was some basic volume discussion and recognition of MOQs.
Fashion-Three	"Final sample review" Physical samples	15	3 hours 40 mins	227	62	No forecast volumes were discussed, no overall commercial value plan or volume picture. There was no sense check to any plan. The meeting is predominantly a product review, go/kill decision meeting. Decisions appeared to be made mostly on judgement and intuition. There were no supporting analytics. It is a "fast-paced" meeting. Any volumes discussed were feedback, current sales levels. No SCO productivity targets were presented, discussed or reviewed, though an overall SCO count target was clearly stated: Mens to drop from 263 developed to 175 for the range. There seemed to be no outward problems amongst the participants when kill decisions were made, The use of colour seems important to brand positioning. The overall review approach is to assess all the styles, in all the colours in the same gender category, at the same time. On some occasions there were 13 or 14 SCOs presented and reviewed in one go. The go/kill decisions were made on the overall look and aesthetics of the product from a group participant view of what works and what does not.

APPENDIX Q

Sense Checking of Results with Informants: Protocol

1) Describing the business problem of review meetings and the application of control mechanisms
2) The FAC Framework;
    1. Explaining that there were different levels of FAC sophistication
    2. Describing the increasing levels, starting at Level 0, “no measurement” up to Level 7, “Product category level review of the FAC metric target”
3) The range build performance management framework;
    1. The theory that increasing the level of FAC sophistication in stage-gate NPD increases the key performance metrics of cash margin and SCO productivity.
    2. The range build metrics were driven by performance improvements from six key drivers; range structure performance, design performance, price architecture performance, more objective informed decision-making, up-front planning performance and improved cross-functional alignment.
    3. The key components of each of the six drivers, as shown on the framework result were next described (Figure 35). For example, the “Range structure” performance improves through;
        i. The role of each SCO is justified
        ii. Any overdevelopment is understood and managed
        iii. Duplication, cannibalization and divided sales are avoided
        iv. MOQs are achieved.
4) Asking what the informant thought about the two frameworks and the use of the frameworks to improve the performance management of product range building.

APPENDIX R

"THE 12 CONTENTIONS"; The standards for good action research

	"Contention" (Eden and Huxham, 1996)	**The performance of this study compared to the contention "checklist"**
1	*Action research must have some implications beyond those required for action or generation of knowledge in the domain of the project. It must be possible to envisage talking about the theories developed in relation to other situations. Thus it must be clear that the results could inform other contexts, at least in the sense of suggesting areas for consideration.*	This study and theory development could inform commercial organizations managing large portfolios of products through stage-gate NPD.
2	*As well as being usable in everyday life action research demands an explicit concern with theory. This theory will be formed from the characterization or conceptualization of the particular experience in ways which are intended to be meaningful to others.*	This study has an explicit concern with management control systems theory and the application of FAC by NPD management teams.
3	*If the generality drawn out of action research is to be expressed through the design of tools, techniques, models and method, then this alone, is not enough – the basis for their design must be explicit and shown to be related to theory.*	The generality has been expressed by the development of the two frameworks and also the explicit relationship of FAC to management control systems theory.
4	*Action research will generate emergent theory, in which the theory develops from a synthesis of that which emerges from the data and that which emerges from the use in practice of the body of theory which informed the intervention and research intent.*	The intervention, raising FAC levels, has improved performance and develops theoretical knowledge. The interventions provided the opportunity to test a new and complex theoretical framework.
5	*Theory building, as a result of action research, will be incremental, moving from the particular to the general in small steps.*	The "particular" is the action research in the branded footwear and apparel industry. The "general" is moving the argument to commercial organisations managing large portfolios of products through stage-gate NPD.
6	*What is important for action research is not a (false) dichotomy between prescription and description, but a recognition that description will be prescription (even if implicitly so). Thus the presenters of action research should be clear about what they expect the consumer to take from it and present with a form and style appropriate to this aim.*	The consumer "take-away" is that raising levels of FAC influences NPD management teams to improve portfolio performance and strategic alignment. Also, for practice, the intervention methodology can be used as a "toolkit" to change the levels of FAC applied.
7	*A high degree of method and orderliness is required in reflecting about, and holding on to, the emerging research content of each episode of involvement in the organization.*	Each intervention and subsequent involvement is captured for participation, context, process and content (Pettigrew et al., 1989). The "developmental process model" (Van de Ven, 2007) is a research output from capturing the intervention

	"Contention" (Eden and Huxham, 1996)	**The performance of this study compared to the contention "checklist"**
		events and results. A high degree of "method and orderliness" is applied throughout the study.
8	*For action research, the process of exploration (rather than collection) of the data, in the detecting of emergent theories, must be either, replicable, or demonstrable through argument or analysis.*	The research design, methodology, results and analysis are explained and presented. This will allow and enable replicability of the "process of exploration".
9	*Adhering to the eight contentions above is a necessary but not sufficient condition for the validity of the research.*	
10	*In order to justify the use of action research rather than other approaches, the reflection and data collection process – and hence the emergent theories – should be focused on the aspects that cannot be captured easily by other approaches. This in turn, suggests that having the knowledge about, and skills to apply, method and analysis procedures for collecting and exploring rich data is essential.*	The use of action research as the project methodology has been considered. Changing levels of FAC and capturing changes in performance can be achieved by intervention and longitudinal qualitative study. I have the knowledge and skills to apply the data collection and analysis procedures: engineering and process knowledge, management accountant, researcher, NPD practitioner, context experience and consultant.
11	*In action research, the opportunities for triangulation that do not offer themselves with other methods should be exploited fully and reported, but used as a dialectical device which powerfully facilitates the incremental development of theory.*	Triangulation has been a key focus in the research design. For P3 there are multiple cases and informants, in different NPD roles, in each case. There is observation of review meetings, semi-structured interviews, capture of performance measures and study of documents. This provides both data and methodological triangulation, 'multiple instances from different sources, using different methods' (Miles and Huberman, 1994). The research design also enables cross-case comparison.
12	*The history and context for the intervention must be taken as critical to the interpretation of the likely range of validity and applicability of the results.*	The industry context, the units of analysis, the NPD process and the interventions have been described in the study. The research design has also controlled for most of the P1literature identified moderators.

APPENDIX S Pre-Intervention presentation to the MDs; Controlling for the "Top Management Control" moderator

TOP MANAGEMENT INTERVENTION

DETRIMENTAL BEHAVIOURS

Too much control (except where uncertainty is high)

Taking a more directive role and at the wrong time (late stages)

High levels of intervention

Adopting too much close monitoring

BENEFICIAL BEHAVIOURS

Using a combination of management control approaches to focus attention - "organised entrepreneurship"

Communicating agendas

Foster learning on uncertainties (in the face of the strategic vision)

Championing ideas

Communicating an aspirational vision of the future

Providing appropriate feedback to the product/C2L teams

Developing a facilitator or integrator role

Deciding whether to "lead" or "follow" the market (innovation aggressiveness)

"*The ability of top management to influence C2L is greatest at the front-end of the process*" Poskela and Martinsuo (2009) The Journal of Product Innovation Management

APPENDIX T Domain Relevant Knowledge: Industry experience – intervention participants by case

	INDUSTRY YEARS	INTERVENTION PARTICIPANTS		INDUSTRY EXPERIENCE (Years)	
SPORT-ONE	25.0	David R	Brand President		
	9.5	Ian R	Business Analyst	Range	1.8 to 25.0
	8.5	Sean H	Vice President of Product & Marketing	Mean	8.2
	7.0	Ashley C	Category Manager	Median	5.4
	5.9	Matt B	Chief Operating Officer		
	5.0	Gill W	Supply Chain Manager		
	2.5	John R	Supply Chain Team Leader		
	1.8	Jamie C	Head of Category Strategy & Planning		
SPORT-TWO	7.8	Gemma S	Category Manager	Range	1.8 to 7.8
	7.0	Gareth H	Product Category Director	Mean	5.5
	1.8	Marc A	Business Analyst	Median	7.0
WALK-ONE	22.0	Lisa R	Product Manager	Range	1.2 to 22.0
	21.0	David K	FD	Mean	12.4
	10.6	Mike C	Category Manager	Median	10.6
	7.0	Richard P	Operations Manager		
	1.2	James H	COO		
FOOT-ONE	27.0	Duncan A	MD	Range	13.0 to 27.0
	13.0	Jo M	Category Manager	Mean	20.0
				Median	20.0
FASHION-TWO	38.0	George D	Product Director		
	23.0	Daniel M	Managing Director	Range	1.2 to 38.0
	14.5	Mark U	Sales Director	Mean	14.8
	11.0	Mike S	MD	Median	10.7
	10.5	Gavin S	Product Manager		
	10.5	Rob R	Designer		
	9.5	Angela M	Assistant Product Manager		
	1.2	David B	Finance Director		
FASHION-THREE	25.0	Matt R	Managing Director	Range	2.0 to 25.0
	16.0	John W	Head of Sales	Mean	12.7
	12.0	Roger S	Design Manager	Median	12.0
	8.7	Jon S	Supply Chain Manager		
	2.0	Mai F	Head of Marketing		

APPENDIX U Data capture during intervention - Protocol

(Pettigrew et al., 1989)

CONTEXT

Who is involved in the intervention? What are their roles and responsibilities?
How long have they worked in the industry?
How complex is the product portfolio?
What is the extant level of FAC sophistication assessed by participants?
What is the maturity of the management team, in managing stage-gate NPD, compared to the other cases?

PROCESS

What additional intervention is required beyond my presentation of the graphics and Frameworks? Analytical support? Facilitation of review meetings?

What is the management response to the concepts presented in the intervention?
How are management discussing FAC and how are they considering making changes to the NPD process?
What changes are being proposed that could impact the future FAC level?

Post the intervention meeting

- Replay what happened and note it down
- Use prompts from documents, recordings and photographs of schedules developed with management
- Transcribe recordings.

CONTENT (Outcomes)

How have management used the FAC Framework? Have they been able to use the Framework? Did they find it easy to use and useful in deciding the changes being made to the management of the stage-gate process?

What changes are management making to the information to be used in range planning and stage-gate decision-making?
What changes are being proposed to managing stage-gate meetings?
What changes are being made to the assessment of range build performance?
What changes can be categorized as changes in FAC?

Capture peoples' views and perspectives of the changes that are taking place.

APPENDIX V Post Intervention: Semi-Structured Interviews Protocol

1) Has your approach to range building changed? How? Why?

2) Has your range build performance changed? How? Why?

3) Have you made changes to controls in the process? How? Why?

4) Which of those have had the most significant effect? Why?

5) Looking at the (FAC) Framework, what level were you at a year ago? Where are you now?

6) How important is consolidating the changes you have made to achieve higher FAC levels?

7) Looking at the Performance Framework what have been the significant changes since making the changes in controls? What hasn't changed? Are there other effects that are worth noting?

8) Do you think the FAC Framework;
   i. Can be used?
   ii. Is easy to use?
   iii. Is useful?

9) Do you believe that the changes in range build performance are a direct result of the changes in control? Why?

10) What was the key aspect of my intervention that helped? Why?
    What didn't help? Why?

11) Is there anything related, not discussed, that is worth mentioning?

APPENDIX W Semi-Structured Interviews - Informants

13 interviews completed

Brand	INTERVIEWEE ROLE	INTERVIEW TIME	INTERVENTION PARTICIPANT
Sport-One	Chief Operating Officer Supply Chain Manager Business Analyst	38:30 39:15 36:16	Yes Yes Yes
Sport-Two	Product Category Director Business Analyst	40:29 49:41	Yes Yes
Walk-One	Category Manager Supply Chain Manager	48:41 29:05	Yes Yes
Foot-One	Managing Director Category Manager Head of Supply Chain	37:34 38:27 35:06	Yes Yes No
Fashion-Two	Product Manager	26:40	Yes
Fashion-Three	Managing Director Supply Chain Manager	49:31 46:15	Yes Yes

Total 8 Hours and 36 Minutes

Of the 13 interviews carried out, 12 were with informants who had participated in the intervention.

The total number of intervention participants was 30.

Therefore 40% of the intervention participants were interviewed post intervention.

APPENDIX X Semi-Structured Interviews Protocol: Group COO and Group CFO

For the intervention brands:

1) Has the approach to range building changed? How? Why?

2) Has range build performance changed? How? Why?

3) Have changes been made to the controls in the process? How? Why?

4) Which of those do you think have had the most significant effect? Why?

5) How important is consolidating the changes made?

6) Do you think the FAC Framework;
    a. Can be used?
    b. Is easy to use?
    c. Is useful?

7) Do you believe that the changes in range build performance are a direct result of the changes in control? Why?

8) What was the key aspect of my intervention that helped? Why?
   What didn't help? Why?

9) Is there anything related, not discussed, that is worth mentioning?

APPENDIX Y "Soft" Measures "Improvement" Data: Design Performance, Price Architecture and Up-Front Planning Performance

DESIGN PERFORMANCE

Sport-One: Business Analyst

Design performance, a performing core, again we're doing more "run-on" product, we've now started to talk about core product that runs for 24 months. Without a doubt we're making headway into design performance.

Sport-Two: Product Category Director

We've been able to spot and work on the category trend opportunities better. When I talk about going deeper we've actually been able to focus in on each style and how it can make more money for us.

There's a lot more data to hand now. The way that we use that data is massively more important than it was eight months ago because we're on the crest of a wave now. And we've built that on the back of analysis, on the back of solid information. I also think it's helped people work out our product lifecycles in a bit more depth as well. I think it is difficult for people to argue against when it is making X amount of money and they want to remove it from the business. What we've learnt to do as well, a lot better than we used to do is mitigate risk. We have shoes in the product line that we know are really successful but we don't like them because they're really old. They don't represent what we want the brand to represent at retail any more. And it's not to suggest that that product is particularly wrong, it's just to say that we want to replace it. It's knowing when to replace it.

I think so. What we need in the range now and what we need in the future. You can see that in our current range where the womens needs to grow faster than it is. Our mens business has been outpacing our womens business too quickly.

The design performance has definitely stepped up a level. The good thing about that is that it has been well-based, it hasn't just been a sudden jump. I think it's been a consolidation of all the other information we've been able to give them to say "these are the things that work and these are the things that don't work and these are the reasons why". Before we were missing the reasons why.

Walk-One: Category Manager

In the past designers used to have open briefs and our sales were declining. Now there's better management of the core range and newness.

Walk-One: Supply Chain Manager

The Category Manager is now looking out longer term, on product lifecycles, making sure the core mix is nailed down and now managing the colour changes. He's deciding things like what green are we going to use and sticking to it.

PRICE ARCHITECTURE PERFORMANCE

Walk-One: Category Manager

We've done a lot of work on price architecture. We've just started on price elasticity this week.

Foot-One: Category Manager

Price architecture was also sorted out early. We needed a "good, better, best" strategy. And there was no clear understanding of our price points.

Foot-One: Head of Supply Chain

Price architecture has improved. We now produce a lot of information about the price curve. And we saw some gaps that we've filled. We had a gap between €110 and €130, that we've filled and we're now flying at that new price level.

UP-FRONT PLANNING PERFORMANCE

Sport-One: COO

There is much more up-front planning to start with. We're thinking big picture first and strategy back.

Sport-One: Business Analyst

We're also making inroads on the up-front planning with the forecasting work in Supply Chain.

Foot-One: Category Manager

Also up-front planning performance. Because once I'd started to get a model in place we were very clear on what was to be developed and how many, what pricing we should look at and the target customer.

APPENDIX Z "Soft" Measures Low / No Improvement Data: Up-Front Planning Performance, Cross-Functional Alignment and Price Architecture

UP-FRONT PLANNING

Sport-One: Supply Chain Manager

I think there's still a gap with the up-front SCO planning. It's calendar planning and issues becoming visible are still a little too late. If we want to start planning our supply chain for the next three years, or the business, there are no details, we can only make assumptions at a top level.

Foot-One: Head of Supply Chain

We don't up-front plan down to a SCO level. We do an up-front overall plan and are good with critical path management. We all know the dates. We get together with the range plan and look at factory allocations. We bring capacities into that. But we don't go right down to a very granular level. It might be that we don't need to because we're quite small. We plan to the level that makes sense.

CROSS-FUNCTIONAL ALIGNMENT

Foot-One: Managing Director

This is interesting, cross-functional alignment. This is the biggest worry I have for my business. I know in the meeting I have with the Category Manager this morning there will not be enough product planned in the collection for our key customer's requirements.

Sport-One: COO

I don't think we're still good enough with cross-functional alignment. People are still quite "siloed" on range planning.

PRICE ARCHITECTURE PERFORMANCE

Sport-One: Business Analyst

The price architecture needs more work on price elasticity.

APPENDIX AA
Other observed perceived drivers of "significant" improvement, not related to changes In FAC levels

Other perceived drivers of "significant" range build improvement, observed by interview informants, not related to changes in FAC levels

UNDERSTANDING OF MARGIN

Sport-One: Business Analyst

A couple of years ago the understanding of margin was almost like margin is some sort of complicated thing. It was "margin percentages are complicated". That basic understanding has now improved and has made a massive difference.

PRODUCT SEGMENTATION

Sport-One: COO

I think we've got a lot better on product segmentation. We now have Category leads on the key product strategy areas. We're saying this is important to our strategy because it is this consumer, this segment of the market and this is how we're going to go after the opportunity.

VENDOR RELATIONSHIPS

Sport-One: COO

The other thing on range planning is that we've listened more externally. When I think about the vendor meetings we've had and strategic performance reviews, they're giving us really harsh feedback now. For example the high number of bespoke colours that were causing unnecessary additional cost. We're now moving back to a standard colour palette.

Fashion-Three: Managing Director

Secondly there was vendor relationships, so vendor engagement ensuring that we had the right relationships. And that the relationships went from being "vendor" to "partner". We consolidated a lot of our purchasing so we went from a disparate to a consolidated vendor base, using an assessment of core capabilities.

Putting in the right processes. So from vendor engagement, making sure we were completely happy with the vendor before we started any development.

INCREASED DELEGATION

Sport-Two: Product Category Director

Because I'm managing people more, I now delegate more, because it allows people

to think through the problem you're putting on the table. You find that people from Design have very different ideas to people from Category about what should actually happen with this particular shoe. Designers are obviously designers, they like to be "this is the most beautiful thing I've ever seen". It is easier to let other people get there because they are more engaged then, into that process. When I was a Category manager I was close enough to the business and my range plan spreadsheet and better able to say whether or not it would be successful. Now that I'm apart from the process I have to encourage that discipline in other people.

CRITICAL PATH MANAGEMENT

Foot-One: Head of Supply Chain

And that is also because we are a lot more structured, in the calendar in the way that we buy. There is loads more disciplines in the calendar management. That's not necessarily added performance on the range but the very fact that we've got a better product development process means that the samples come through on time. Which means we can sell to the sample, in our calendar, and the whole thing becomes much more disciplined. We've also got things like a confirmation tracker in our operational process. We won't place an order on something if it's not fully confirmed. We actually used to do that. So that might have been questions around price or sign-off of a confirmation sample and yet we'd place an order for it. And behold, that order was always going to be late. A more disciplined calendar and process has made a massive difference.

PROCESS OF AGREEING PRICES WITH VENDORS

Foot-One: Head of Supply Chain

We have a new process for agreeing FOBs with vendors. We've got some new tools that we've developed, which work out cash margin, as opposed to percentage margin. So we are able to use models in those negotiation meetings. So we know what the target is, we've given the vendor the target, and we also know what our internal target is. And so if a vendor says they can't do it for $18 but they can for $18.50. We can work through what does that mean, whether it's still worthwhile. And what would be the new wholesale price required to maintain the margin target. So we do scenario planning in the meeting should we need to. We also have a scale. So if we think the style is going to do 300 pairs, or we think we're going to do 3,000 pairs, we're now looking at the forecast cash margin, as opposed to trying to get to a percentage target. I might be happier to go with a lower percentage than the target because of the cash value.

FINANCE TEAM CULTURE

Foot-One: Head of Supply Chain

Having a different culture in the Finance team has taken us to the next level. So when you ask what's the most important thing perhaps it is actually having the right type of attitude around the senior table. Attitude was a big problem for us.

GOVERNANCE ON VENDOR SELECTION

Foot-One: Head of Supply Chain

I know it's not specifically about range build but the fact that we were with the wrong vendors and we didn't have the right governance is massive. The governance issue was about having the vendors who could do what's required. So a lot of this stuff is about process. But ultimately, if you're with the wrong vendors, then a lot of this stuff is lost in the wind because you need to be with the right partners. We've made a massive change.

NEW ANALYST IN THE TEAM

Foot-One: Category Manager

We got an analyst on board who understood and was able to apply certain analytics to range building. He was able to bring a different view as well. Between the two of us we built a different reporting structure and format. It wasn't just about past sales of each category it was also the SCO efficiency, the value, the number of pairs and how much each unit earned, in a ranking range.

ORGANIZATIONAL CHANGES

Foot-One: Category Manager

We were also changing the rest of the business. There was change in the Sales Team and understanding the accounts, who we should be working with, where we were going to get our sales growth from. We changed the supply chain way of working, making sure we were working with the right vendor. I was the linchpin in those changes making sure we were hitting certain target margins and how many pairs we needed to be focusing Design on.

CONSUMER INSIGHT

Fashion-Three: Managing Director

There's the "insight" piece, understanding our consumer better. The whole piece around what we are, what we stand for, who our consumer is. Making sure we're designing the right product for our consumer.

We have all the information we can get from the Marketing team on consumer, from Sales what is performing in retail, competitors and price points, all the insights we're putting into the mix. Who's wearing the products, how much they're paying, where they're buying it from. Understanding who they are and how we engage with them.

APPENDIX BB Challenges with using the FAC Framework

Observed challenges with using the FAC Framework

CHALLENGES WITH USING THE FAC FRAMEWORK

Sport-One: COO

For some people the language needs to be simplistic, especially for designers.

Sport-Two: Product Category Director

It's difficult to hit that Category level review of the SCO productivity target because you're dependent on people buying things. Sales people like lots of stuff, that's what they like, they like lots, a wide spread of anything that I can go in with to the retailer. The challenges with our Sales guys is handling objections from the retailer and you can't hit that SCO productivity target if you can't handle objections with the retailer. Because what happens is they go "Oh, you don't want that. Ok, I'm going to do it for you and I'm going to do it in blue. Oh, and you only want to buy 50 or 100 pairs, that's fine." And that destroys your SCO productivity target in one fell swoop.

Not that I don't think that any of it is unhelpful. I think the challenge of each level is different, very different. You've addressed it through the sophistication level but there is a big difference, for example, between "Product SCO Level Forecasting through the NPD process" at Level 3 and a "Category level review of the SCO productivity [FAC metric] *target" at level 7. Even though they are part of the same subject , it's a different challenge.*

The other thing that I think is challenging around this, and though it's not that the Framework isn't useful, it's getting people to understand the importance of doing these things. I think that's a challenge across the entire business. If you start speaking to certain people about SCO productivity, they just switch off because it's not important to them. And it doesn't show up on their personal performance reviews. There's no way to engage people in that conversation. It would be helpful if it was in Sales targets. Then the information you would get back would be different to the information we currently get.

I think to a certain extent that level of unpredictability, we need to find people who can do this because we know it's measuring things that we know is going to make us successful. But it's also people that have got a level of sophistication in terms of dealing with the unpredictable nature of the things that we do. Ultimately what people need to understand is that things like these frameworks help create the conditions for success. They don't necessarily create the success itself. Because there are so many different factors that go into it that it's difficult to pinpoint one particular thing. With our team now I've changed almost the whole critical path, I want to bring in a level of unpredictability into our process because we've got our focus right now but for us to take that extra step is going to require us to do something unpredictable.

Foot-One: Head of Supply Chain

I do wonder whether the Category stuff sits on the top. You could say it's almost going down quite a low level and then it gets some way up again. I don't know whether we might do some of that.

LIMITATIONS OF MARGIN MAPPING

Sport-One: Business Analyst

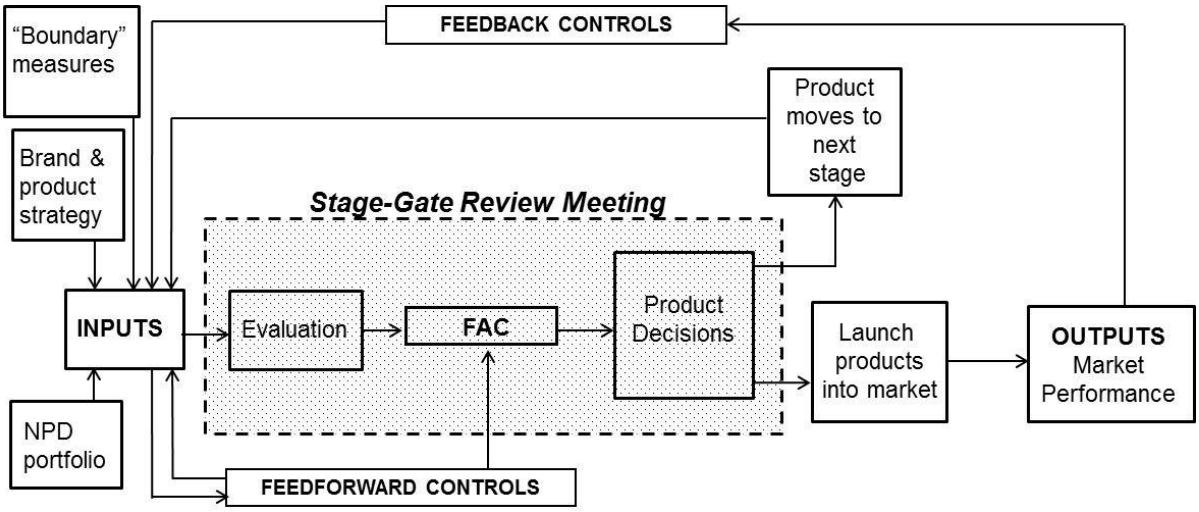
There are limitations with the margin mapping; there are ways of manipulating it to keep product in the range. We're having to take more care. Also, we still need to take into consideration the entire range to make sure we take out products in poorer performing categories.

However we still need to address the SCO tail of the whole business, not just the categories. You have to take the big picture view as well as the category detail.

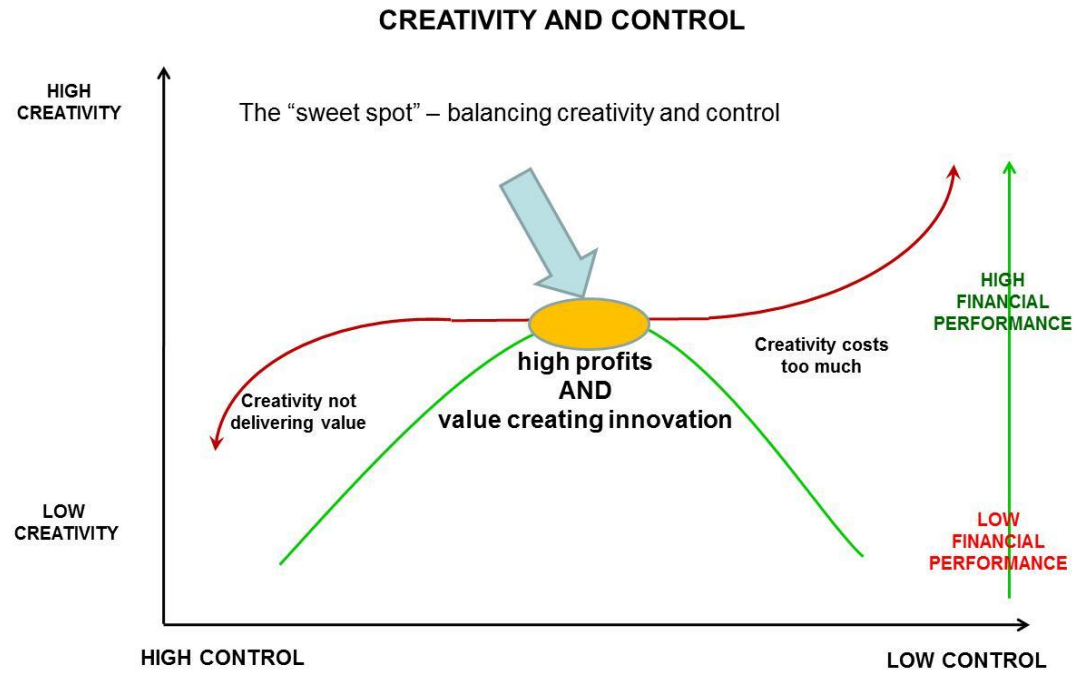
Appendix CC

Intervention Approach - Graphics

NPD Stage-Gate Review Meeting Represented as a Control System



The Idea of "Balancing" Control and Creativity



Appendix DD (Baker and Bourne, 2014)

INTERVENTION METHODOLOGY: DESCRIPTION OF THE FAC LEVELS

Levels 0 and 1

At level 0, brand businesses exhibiting the poorest governance would not be doing any measuring or performance assessment of their range build activity. Level 1 is reached when feedback from the performance of current or prior ranges is considered.

Level 2

The next level, level 2, involves forecasting and target setting at the product category level. This helps management anticipate the performance outcomes of the new range on measures such as volume, sales revenue, and product margin. This is more than a high-level plan, as it forces managers to forecast at the product category level; product category classifications allow managers to consider easily identifiable and sizeable groups of products.

Level 3

Level 3 is a significant step change in control sophistication. Forecasting is carried out at the product level, the lowest granular level. This product-level forecasting is carried out a number of times during the NPD cycle to help anticipate the market outcome. There is also a validation and “fit” check at product level to assess whether the different strategic demands required of the product range are being met by the products under review.

Level 4

Level 4 represents another step change in NPD control with reporting and target setting for productivity ratios. Typically, the most crucial productivity metric is cash margin per product, although unit volume per product can be used, which is simpler to forecast. The “FAC metric” plays a crucial role in planning and has significant impact on the control of the NPD portfolio. It helps guide product selection decisions, balancing control with creativity, and focuses attention on desired outcomes. This enables filtering out excessive NPD.

Level 5

At Level 5, managers also apply scenario planning, a risk management tool that can also help the management team visualize the future. Scenario planning is used to manage the level of uncertainty and assess whether the planned product range will deliver financial and strategic targets. Managers use this higher level of feedforward control to weigh alternative courses of action and to assist in improving the product portfolio value.

Levels 6 and 7

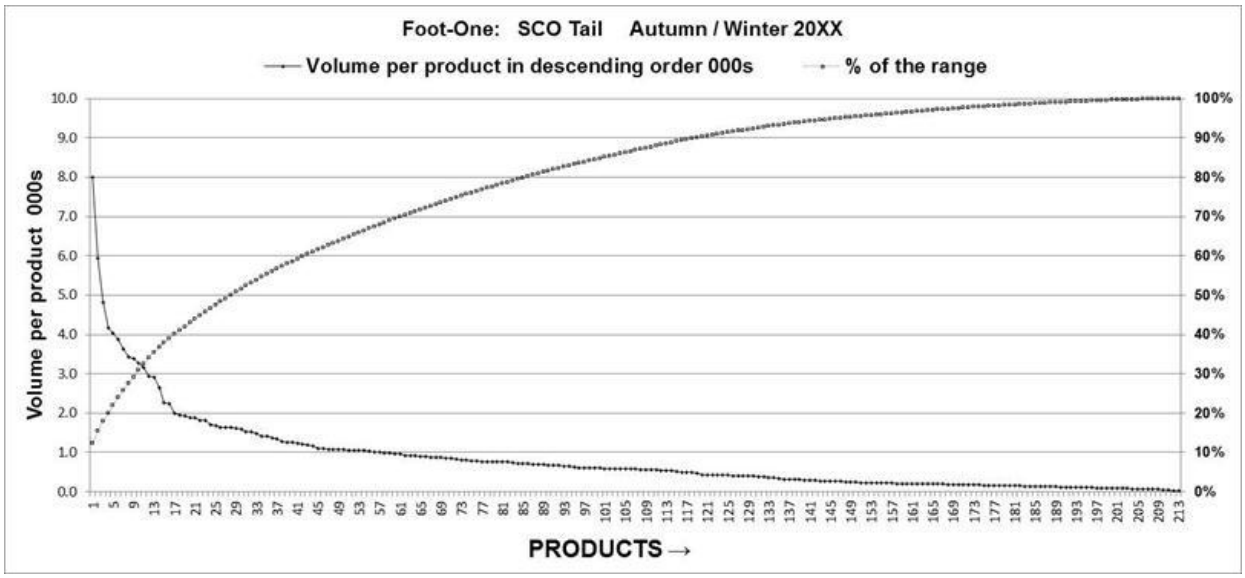
The highest levels of FAC sophistication exhibit the use of target validity checks, first at the product-category level (level 6) and second with the FAC metric (level 7). The combination of a target productivity metric with an anticipated volume or cash profit outcome determines the optimum size of the portfolio. For example, a target cash margin of $10 million with an average cash margin per product of $50,000 suggests an optimum portfolio size of 200 products. This type of calculation, based on a target productivity metric, guides decision making and further reinforces the crucial role that the FAC metric can play in governance control.

Note

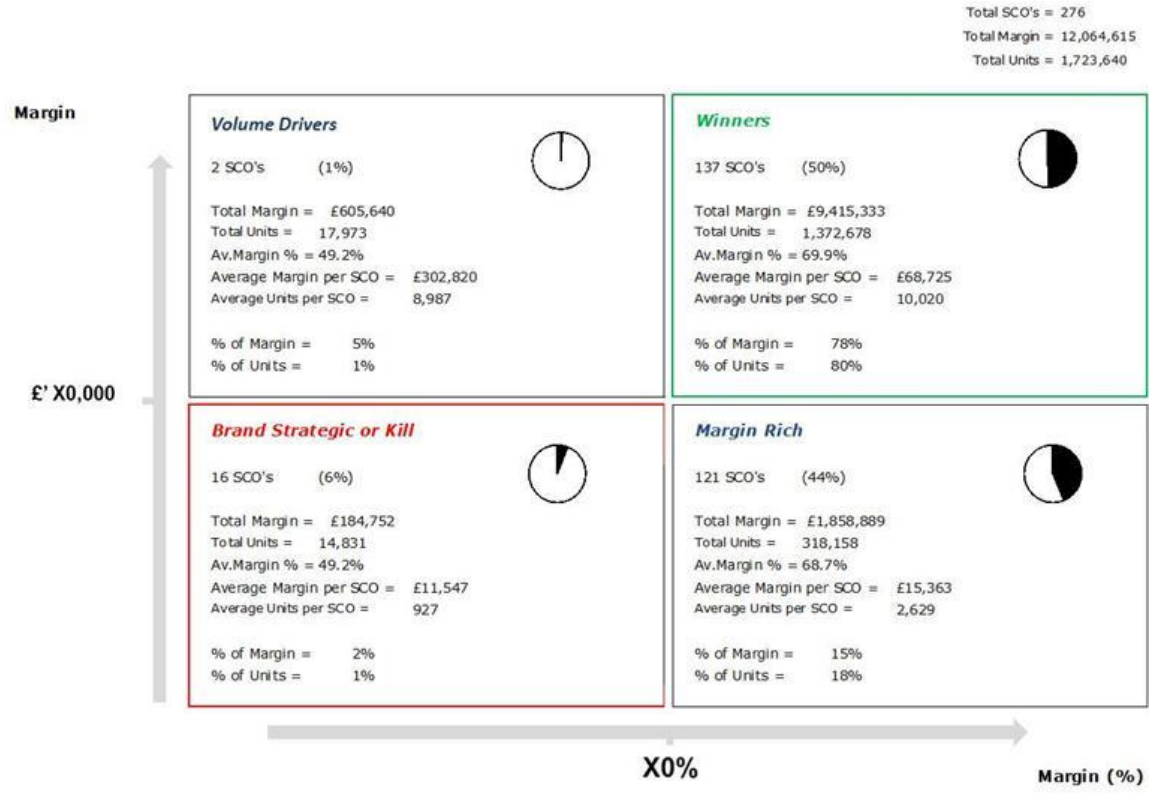
Each higher level of FAC sophistication is built on the application and learning from the lower levels. This means that attempts to operate at higher levels are unlikely to be effective unless lower level applications have been consolidated.

Appendix EE EXAMPLES OF POSSIBLE NEW ANALYTICS AND PERFORMANCE INFORMATION

PRODUCT "TAIL" ANALYSIS

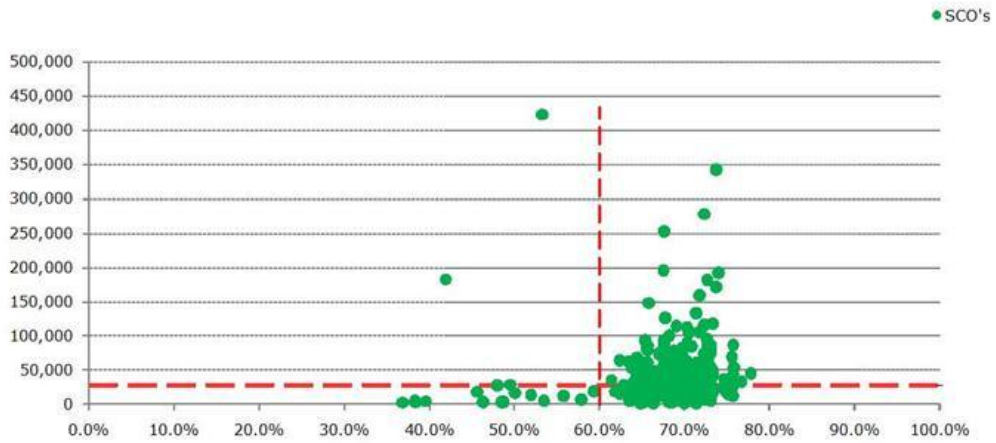


MARGIN "MAP"

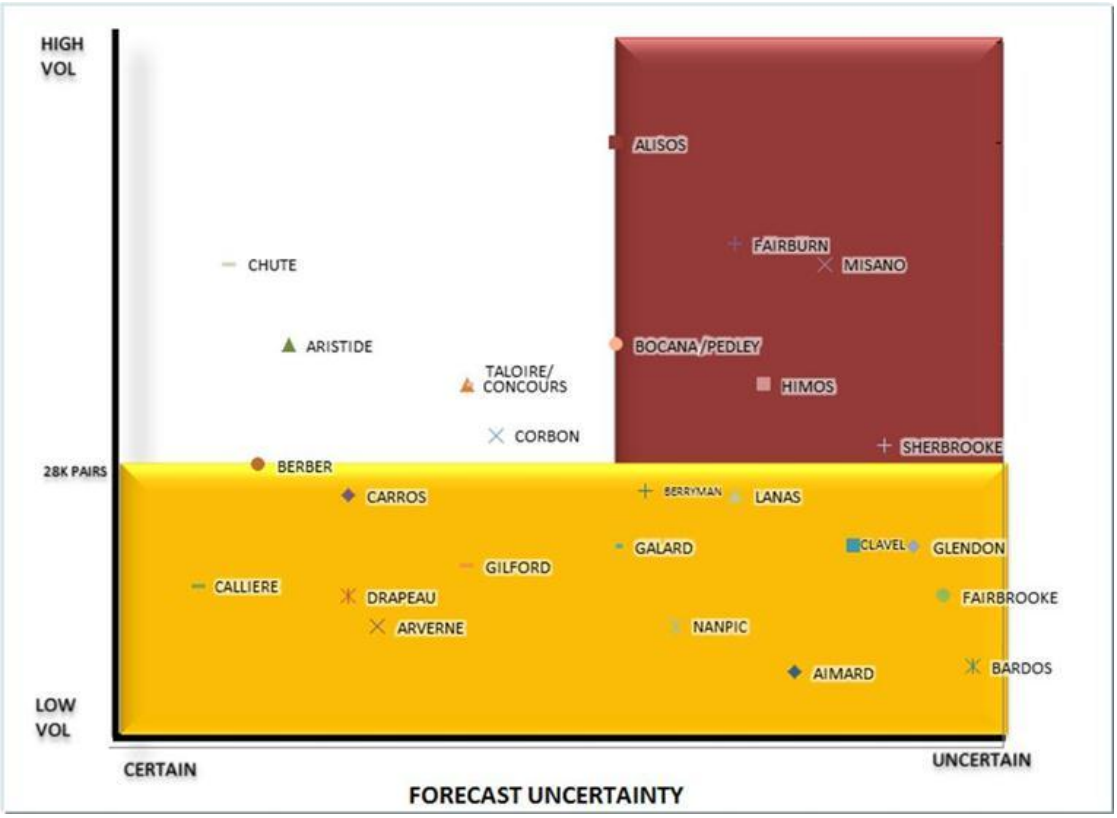


“SCATTER-GRAPH”

SCO Type	Count	%	Std Margin		Margin %	
Winners	137	49.6%	50.4%	> 30,000	93.5%	> 60%
Marg. Drivers	2	0.7%		= 30,000		= 60%
Strat?	16	5.8%	49.6%	< 30,000	6.5%	< 60%
Marg. Rich	121	43.8%				
Total	276	100.0%				



FORECAST UNCERTAINTY CHART



Appendix FF

INTERVENTION – AN INTERVENTION EXAMPLE DESCRIPTION

INTRODUCTION

I present an example of one of the interventions, with case Fashion-Two. Firstly I note contextual factors of the case. I next describe the first two key intervention actions, out of a total of seven intervention actions. In the other five intervention actions with Fashion-Two my role was to support, challenge and review the approach agreed by the team in Intervention Action 2.

I note the participants in these interventions and the team responses. I present data captured during the intervention and my coding, where applied.

The rest of the interventions with the other cases were similar to Fashion-Two but not identical.

FASHION-TWO

Context:

- Lowest revenue portfolio of the six cases (a relatively smaller business)
- Lowest pre-intervention portfolio productivity of the six cases
- Seven intervention actions in total in Fashion-Two, over a 25 week period, with a total of seven participants
- Apparel product portfolio with multiple product categories e.g. jackets, shirts, T-shirts, Polo shirts
- Pre-intervention, team self-assessment; FAC level 1
- Post-intervention, team self-assessment; FAC level 4

Intervention Action 1 (Project Week 18)

Participants: Managing Director, Finance Director, Sales Director, Product Director

After my presentation of the intervention graphics the team initiated a discussion to understand the implications. They seemed to need guidance on the next steps to take. I presented a number of potential next steps:

- Establish forecast volumes for the portfolio and each product category in the portfolio, for the next product season being designed and developed (Spring Summer 2013)
- Establish target portfolio and product category productivity targets (volumes per product). I asked 'What quality of volume purchase order do you want to be placing with your vendors?'
- Review these forecasts and targets against business plans.

The team responded with comments acknowledging the need to change their approach to building portfolios and recognition that performance has not been good enough. Some of the team comments in response:

- 'I'm starting to think why we haven't done this before. Like all good tools it's quite simple and straightforward'
- 'In my view we'll do less and achieve more' [***Coding – New heuristic?***]
- 'We have a performance issue, people not able to design to a margin' [***Coding – Recognition of poor performance***]
- 'There's five margin points in this but turn the recorder off'.

The team discussed and agreed that the next step was to organise a meeting, involving the Designer, to establish the practical implications for the Spring Summer 2013 apparel range, the season for which design and development was about to start. The ideas were to be applied to the NPD portfolio for that new product season.

Intervention Action 2 (Project Week 22)

Participants: Finance Director, Sales Director, Product Director, Designer

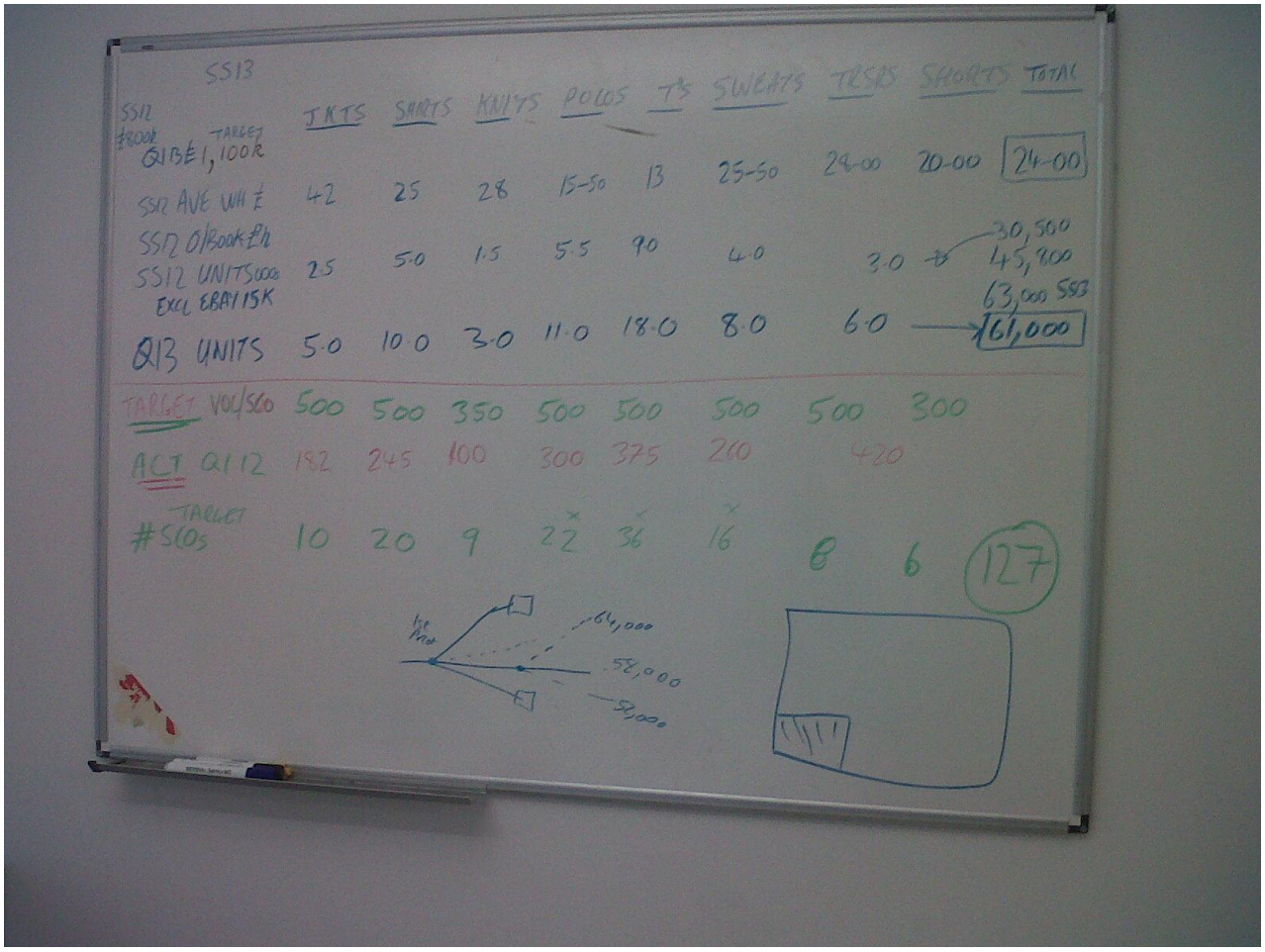
I started by presenting the idea of the mathematical relationship between 1) the volume target, 2) the target product productivity (FAC metric) and 3) how this helps determine the optimal portfolio size.

The team noted that the suggested changes were obvious and straightforward, and I also observed them challenging their previous NPD portfolio approach and performance. Some of the initiated comments and ideas from the team:

- 'Really obvious. Really straightforward. It makes a lot of sense and I'm thinking why haven't we actually done this before?' [***Coding – Motivation to act***]
- 'I think the crucial thing is we haven't supplied that sales target and unit volume information before. Ever. I've never known what my figure was for a season'
- 'The start point is that target. Why that target?'
- 'We're working on SS13 now and I want to give the lads a framework to work to. So this is great. To be honest with you this raises as many challenges as it gives answers. It's right we should challenge it.' [***Coding – Greater challenge***]
- 'If we're going to sell 61,000 pieces in Q1 are we actually targeting the right consumer? Is the lad that we're going after, is he commercially at a level where we can sell 61,000 pieces? My worry is are we going after someone a little too fashion, too niche? In which case it will only be 25,000 to 30,000 pieces. It's that real terracy pub football boy who we need to sell 61,000 pieces. Is it the lad we are all talking about as our punter? And I don't know the answer to that?' [***Coding – Greater challenge***]
- 'The other thing I see as a massive advantage on here, when we get to the actual laying out of styles across the range plan, on any of these categories. Because you've got the SCOs there, you'll have four pieces of knits for example, your good one, your two better ones and best. And you're done. And there will be no splitting of these styles. If you look at the jackets we've got ten colourways at the moment, 2 colourways each, that makes only five jackets. With what we've got at the moment some are doing the same job, it's diluting what we're trying to do.' [***Coding – Recognising issue of product "duplication" in the portfolio***]

A key comment from the Product Director, prompting action in the meeting, was: 'It would be good to do a dry run with all the data, pre-order'.

Therefore, in the meeting, I next facilitated a discussion on the portfolio size, productivity and portfolio targets. A photograph of the whiteboard work is shown below.



The discussion seemed to give the team more confidence to act and they were motivated to implement the newly recognised portfolio planning and control improvements. The team comments after establishing the portfolio target variables:

- ‘This is very straightforward’
- ‘There is already something here for my team to work within. There are some concrete parameters, more professional parameters to work to. We’re looking at it statistically.’
- ‘Less is more. [***Coding – New heuristic?***] It strengthens your message. Because what brands tend to do is they get the fishing net out and throw it as wide as they can and hopefully catch something. What this does is actually say, it creates a message, “this is our message”. This is who we are. On bigger picture thinking. The less product you have, if you halved what we’ve got in the showroom now you’d have a stronger message.’
- ‘That’s what I was thinking. I sort of feel empowered by this now. To me there’s a lot of common sense things there. I’ve got the numbers down. I think we can go

away and look at it. The key thing that we would also need to put together is price points where we start and where we finish. Taking it down to say 12 SCOs on jackets, 2 SCOs per jacket, it's only six styles. We need to be quite clear about where we start and where we finish.' [***Coding – Confidence to act***]

- 'For me this is back to reality. It's clear, we're over-exposing ourselves for no reason. I'm putting workload on my team, I'm putting workload on the supply chain and I'm disappointing lots of people. I want to go to the Far East and say to people, "yes you've only got seven styles but you've got the exact amount that you had last time when you did fourteen". You're far more productive.' [***Coding – Recognition of poor performance***]
- 'I should be able to present back, in the final analysis, that every garment is absolutely there for a reason.' [***Coding – Confidence for more challenge***]

In the additional five intervention actions with Fashion-Two my role was to support, challenge and review the approach agreed by the team in Intervention Action 2 to improve the portfolio management controls. Post Intervention Action 2 the team undertook changes to formalise the agreed approach within their NPD process.

Fashion-Two the lowest revenue brand, at pre-intervention had significantly the lowest productivity. Post-intervention Fashion-Two has reduced the portfolio size by 65 percent and increased portfolio cash margin by 32 percent, resulting in a cash profit per product improvement of 275 percent.

The rest of the interventions with the other cases were similar but not identical. One of the differences between the cases appears to be the effect of the various starting point FAC sophistication levels. Three cases started at FAC level 1, two cases at level 2 and one case at level 4.